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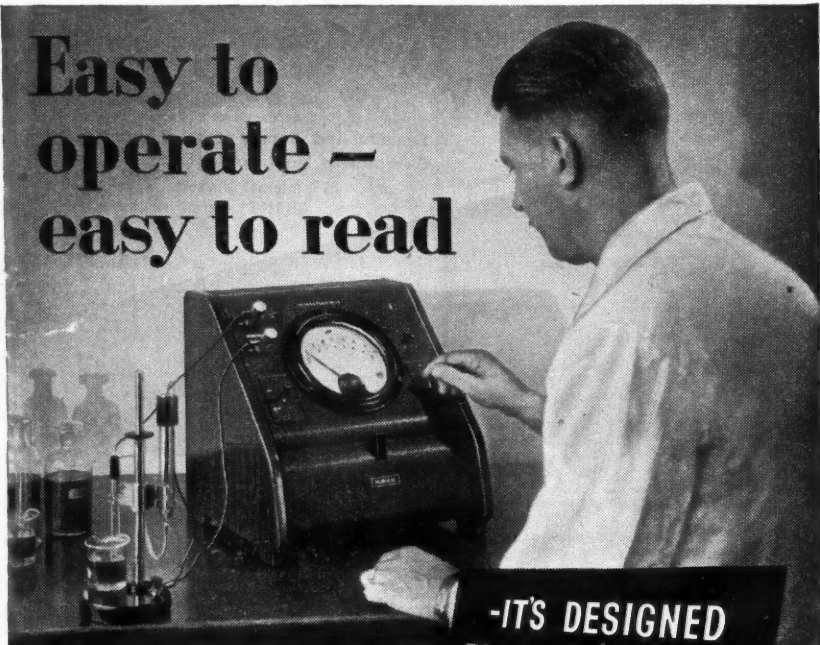
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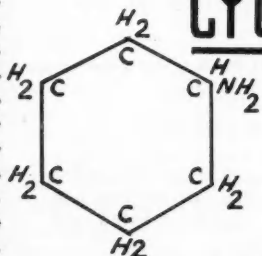
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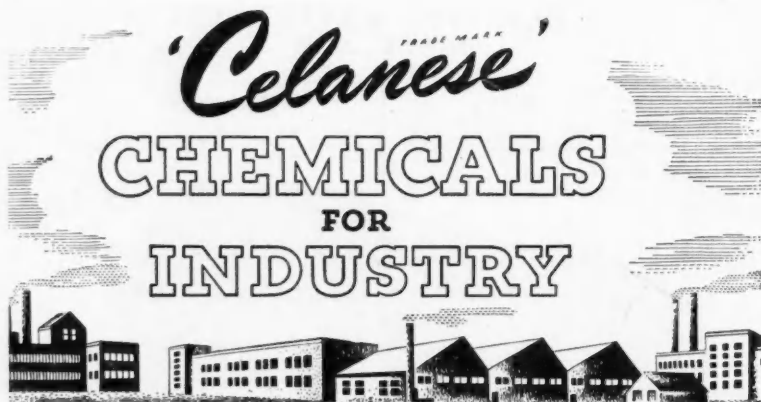
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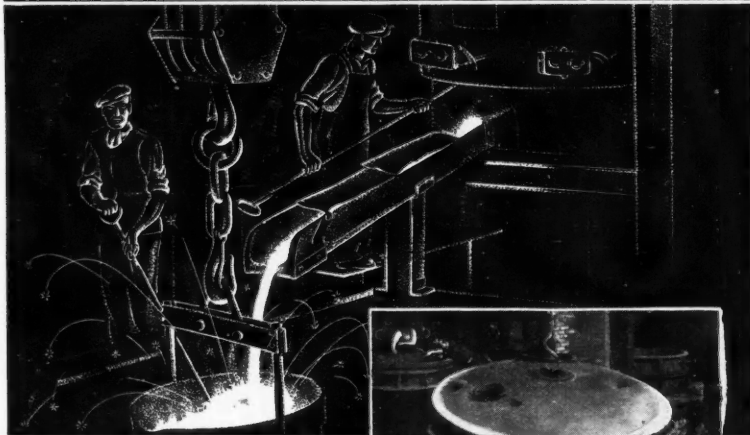
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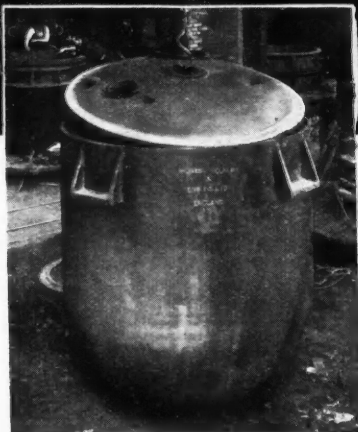
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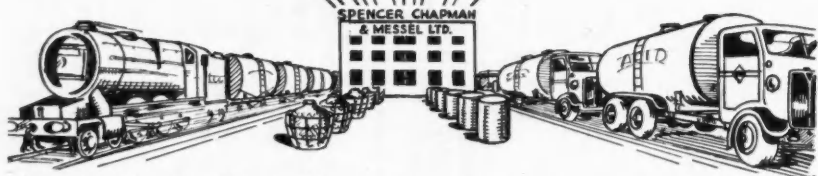
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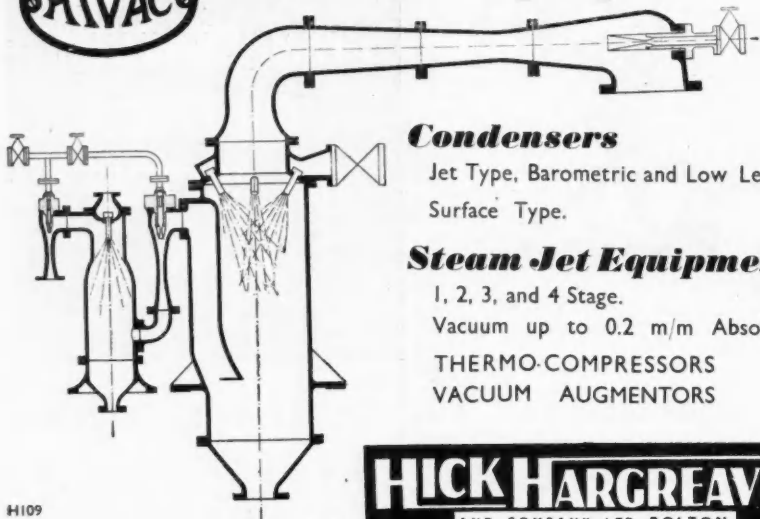
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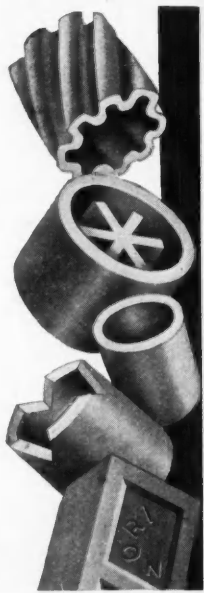
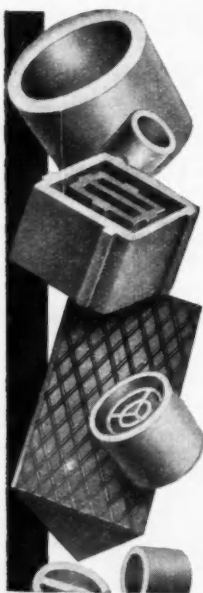
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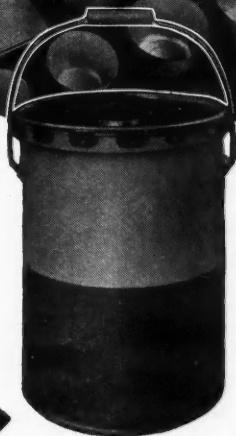
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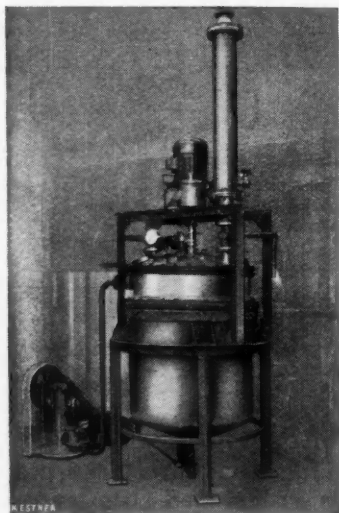
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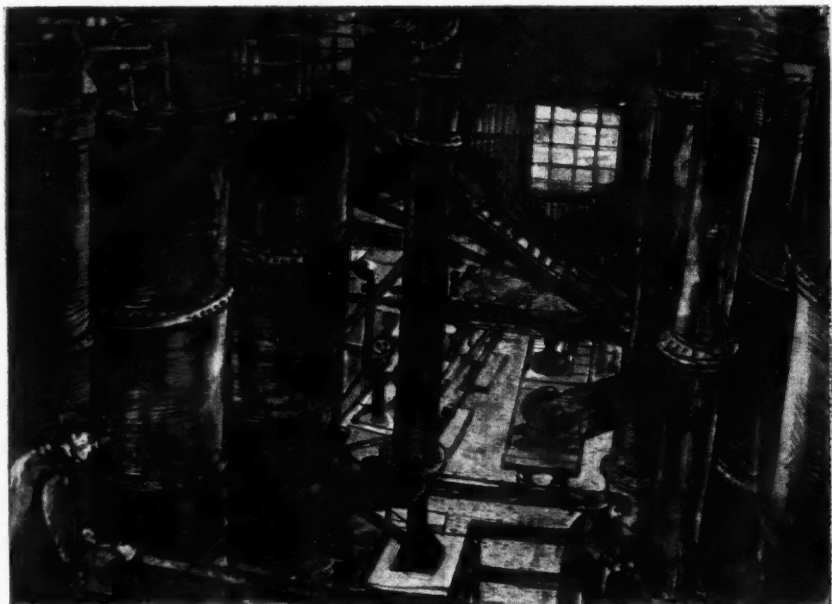
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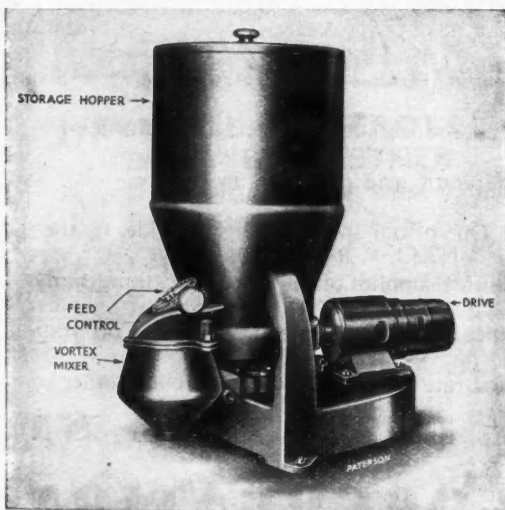
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Perverting the Truth

EVERY chemist will remember that in his earlier attempts at qualitative analysis he was faced at times with conflicting evidence. He was also generally faced with the necessity to complete his analysis within the time prescribed by the school authorities. The combination of inexperience, panic and the desire to show results resulted in a conclusion being reached that was in accordance with what the student fondly believed to be the theory of probability. The deduction was made, all too often on insufficient grounds, that a specific compound was contained in the mixture in overwhelming proportion. Some 60 per cent of the observations agreed with that; the rest did not, but that was unfortunate. Those observations, he concluded, must have been faulty. Or at times he may have endeavoured to determine the proportion of an element present in a given substance. The inexperience of youthful manipulation as likely as not gave four distinct proportions in as many attempts. It then became necessary to select one of them—and, not infrequently, to “cook” the others to give the selection some verisimilitude when the master asked to see the books. Till it did not in Gath, but these habits have been known on occasion to persist beyond school-days. We recollect that a Reader in Chemistry in our University was accustomed to deal with feminine students who failed to secure the proper result by saying with his most pleasant smile: “Really, Miss X, that is

a wonderful result; how did you manage to get it? Was it your woman’s intuition?” Too often, it was.

Yet in after-years we learned how some of the greatest discoveries have been made because a chemist or a physicist has refused to accept varying or anomalous results as “errors” and has painstakingly investigated all possible reasons before accepting the discrepancy. The study of science is a study of truth, and often truth takes a deal of discovering. The gravest and most responsible scientists have been led astray over and over again in the world’s history by accepting an apparently sound hypothesis that later work has shown to be fallacious. Such an hypothesis has fitted most of the known facts, but mature experience suggests that unless an hypothesis fits all the known facts it is dangerous to accept it. The importance of preserving an attitude of independent scepticism is well understood by scientific men. This attitude oft-times makes them unpopular with their business colleagues, and with political powers. “Why,” it is asked, “cannot the fellow make up his mind and tell us what to do? We have to assess the facts on a theory of probability and take decisions accordingly”—in plain English, to guess and to back our guess. The scientist, on the other hand, must make reservations, if he feels that such reservations exist, and can state the truth only as he believes it to be at that time, making it clear that he must be allowed to

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change his opinion. "Don't ask me what I thought a year ago on this or that," said John Hunter, "ask me what I think to-day." And what he thought to-day might be quite different from what he would think a year hence when more facts had been accumulated.

This independent but flexible attitude of mind is the heritage of every scientist worthy of the name. Either he must retain it or he must cease to be a scientist. A Cabinet Minister resigns when he can no longer travel the same road as his colleagues; a scientific man—whether working in a university or in industry—should leave his work for some other occupation if he finds himself unable to pursue truth. There is a grave danger in the world to-day that truth may be distorted for political or other ends. The World Congress of Intellectuals seems to have proved that a proportion of the intellectual world is not concerned with truth so much as with putting forward specific policies or ideas. Mr. A. J. P. Taylor, of Magdalen College, Oxford, did well to insist that common standards were found to be lacking in those assembled. He stood, he said, for the unity of mankind, but if that could not be achieved, then he was for the common European tradition of intellectual liberty, more than one way of being right, freedom of mind, and the artist's freedom of creation.

That this cleavage of opinion seems to

occur in the more advanced scientific and intellectual circles makes it the more significant. Where is it leading us? In the same column of *The Times* that recorded the foregoing events of the Congress at Wrocław, was a news agency paragraph summarising a Moscow broadcast. The Russian Academy of Science, it said, has written to Mr. Stalin admitting "mistakes" made by Soviet biologists, and promising for the future not to fall into such errors but to "co-ordinate their scientific work with the interests of the country for the development of Communism." This letter, we are told, acknowledged that Mr. Stalin should have all the credit for the achievements of the Academy and ended: "We promise you, dear Comrade Stalin, to correct our mistakes and to fight all reactionary theories. We shall take the necessary measures in order to ensure the unhampered development of a progressive Socialist theory of biology, in order to help the development of the great aims of our nation and the building up of Communism." It took a world-wide war to discredit the German biological theories of the "master-race." The danger of scientists forsaking the paths of truth cannot be over-emphasised, particularly when, as in Russia and earlier in Germany, they do so to support an ideology peculiar to a political theory.

NOTES AND COMMENTS

Neglected British Minerals

EMANATING from men who claim to be confident that Britain still has considerable reserves of unmined non-ferrous minerals, even though at the present time world supplies fall short of demand, a memorandum has just been submitted to the Minister of Fuel by the Cornish Mining Development Association, of Helston. It contains a proposal for the resumption, on a much larger scale than hitherto, of metalliferous mining in Britain. To make full use of these known reserves it is suggested that a metalliferous mining development corporation for the whole of Britain should be formed with a Treasury guarantee of aid. The corporation could, it is pointed out, be run in a similar way to the North of Scotland Hydro-Electric Board. The best possible advice would, of course, be taken in selecting the most favourable areas for mining operations, and exploratory mining would include anything up to a major programme of new shaft sinking. The memorandum adds that when the existence of ore-bodies worthy of more intensive development had been proved, the corporation could submit to the Minister for his approval detailed plans for working them. In order to attract private enterprise, the sound suggestion is made that undistributed mining profits and the first 20 per cent of dividends paid by non-ferrous metal mining companies should be free of tax.

The Outlook for Steel

THE knowledge that a crucial stage in the affairs of the British iron and steel industry, or at least of its principal sections, may now be near at hand seems to have produced so little apparent reaction in the spheres of administration or investment that the sweeping proposals for nationalisation which the Government certainly have not abandoned seem oddly remote. It required, in fact, the reminder given a few days ago by Mr. J. H. Jolly, the new chairman of Guest, Keen and Nettlefolds, to call to mind the unwelcome recognition that, failing active and organised opposition outside Westminster, British steel's prospect of continuing to

develop even in the condition of qualified independence prevailing now may not be worth much. It is conspicuous and rather lamentable that the case for the opposition has, as a whole, been presented with less enthusiasm than the proponents of nationalisation have displayed—with much less demonstrable justification. Effectively answering the fallacy that the iron and steel industry is virtually a monopoly exercised by a privileged few, Mr. Jolly's revelation that nearly 23,000 can exercise stockholders' rights to direct the affairs of Guest, Keen and Nettlefolds, more than half of them being "capitalists" only to the extent of £200 or less so far as this firm is concerned, and that only 1000 have £1000 or more invested is the sort of evidence that could be adduced by most other major steel undertakings. The remainder of the case is sustained by the continually rising volume of output which this allegedly misdirected industry has achieved, enabling it in July to exceed its end-of-year export level (£8.10 million) by £1.84 million and to maintain a credit balance on the same basis of £400,000 during the whole of the second quarter of this year. These are evidences which should weigh even in the estimation of those who affect to despise the iron and steel industry's capacity to make profits and maintain an apparently contented labour force.

Autumn Assemblies

SEPTEMBER, the month of seasonal congregation in nature, seems to exert something of the same kind of influence on scientists, judging by the great assemblies taking place in the U.S.A., where the American Chemical Society has been organising very large meetings simultaneously in several cities and the American Association for the Advancement of Science has a programme for its Washington meetings (September 13-17) which corresponds roughly in its scope with the forthcoming meetings in Brighton of the British Association. In respect of size, the first of the American assemblies probably represents the limit for all practical purposes. This is evident from the fact that there is no one suitable city capable of housing all who will attend and

the papers presented number around 700. If subject matter is any true reflection of the general trend in chemistry, the biological field, with its 113 papers, might be assumed to engage a majority of ACS members. That evidence, however, is probably misleading. A more interesting speculation is concerned with the practical value of monster gatherings of the American kind, at which only a very small proportion of the whole can hear any individual paper and nearly all the enlightenment is finally communicated by the ordinary channels of publication. It is surprising to find, in view of the plethora of technical and scientific papers of this sort awaiting publication, that the technical Press in the U.S.A. sees fit to devote a relatively generous proportion of its space to British topics, such as the Royal Society Conference on Scientific Information—which received 2½ pages in the *Chemical and Engineering News*—and our Parliamentary and Scientific Committee, to which the same journal devoted its leading article, observing: "Is it not time for the scientists and politicians of this country to develop an equally good, or perhaps improved, basis of co-operation between Congress and American scientists and technologists?"

Young Scientists

NINETEEN specialists, and about a hundred other young men with scientific qualifications, are to be given the chance in the near future to work at the Harwell Atomic Research Station, near Didcot, Berkshire. The specialists will be offered salaries ranging from £350 to £960 per annum. About 50 experimental and assistant experimental officers are required for service by the end of this year, and it is announced that the Civil Service Commission is holding an examination in order to obtain them. Candidates should be 18 years of age and the minimum qualification is a higher school certificate (or equivalent), with mathematics or a scientific subject, but suitable experience without academic qualifications is acceptable in some cases. Some of the successful candidates will be required to make routine experiments and measurements, and it is felt that girls would be particularly suitable for this work. In addition, about 50 scientific assistants are required for appoint-

ment by the end of the year. For boys of 16 the salaries offered are £155, rising to £276; and for girls of 16, £155 rising to £257 10s. The assistant experimental officers are required to be qualified in one or other of the subjects: physics, electronics, inorganic chemistry, metallurgy, or mathematics.

Register Service Extended

IT is interesting to learn that the Ministry of Labour's Technical and Scientific Register, originally designed to assist former members of the armed forces, has been developed into a nation-wide service for all men and women who are qualified scientists or technologists. A revised leaflet, recently published by the Ministry, explains the scope and functions of the register, which offers a free and confidential service to employers wishing to fill vacancies, and to men and women seeking technical or scientific posts. From its office in London it covers the whole country and posts overseas. Physicists, chemists and metallurgists are included in the register, and in order to qualify a registrant must normally possess a university degree or be a corporate member of the appropriate recognised professional institution. The register is divided into sections corresponding with the various professions. Each section is divided into three main groups: those not in employment, those seeking a change of employment, and those not seeking a change. There are advisory committees to link the register with industry. Sir Robert Pickard is chairman of the committee of chemistry, metallurgy and chemical engineers, and Sir Lawrence Bragg is chairman of another for physicists and mathematicians. It will be generally admitted that administratively the scheme seems admirable. There is, however, still good reason to believe that it is still viewed with a good deal of understandable suspicion by many scientists, whom it is ostensibly intended to benefit. It begins to look as though the thumbs are irrevocably turned down.

Export Control Alterations.—A number of essential oils and some chemical preparations are among goods which do not now require export licences. Changes in export licensing control were made by a Board of Trade Order which came into effect on September 1.

Rapid Reconstruction at Texas City

Production of Styrene Resumed Within a Year

TEN days before the first anniversary of the explosion which devastated their Texas City styrene plant, Monsanto Chemicals Limited resumed partial production when ethylene started to flow from the first rebuilt unit. Between April 16, 1947, the date of the explosion, and April 6, this year, when operations were resumed is a remarkable story of rebuilding a city and its industries which is told in full in a recent edition of the *Monsanto Magazine*.

\$90 Million Damage

The wide-spread damage to the plant occurred when an ammonium nitrate laden ship, berthed in a nearby public dock caught fire and exploded. After the explosion over 500 people were dead or missing, 3382 homes damaged or destroyed, and it was estimated the damage in the area amounted to \$90 million. Among the dead were 145 Monsanto employees, many of them highly skilled technicians.

In spite of the terrible effects of the blast, Monsanto and neighbouring plants have all returned to partial operation, though none of them have yet reached normal production capacity.

At Monsanto, where the chief producing

areas are ethylene, alkylation, hydrogenation and distillation, more than 2000 men have been engaged on the job of rebuilding. It is forecast by the company that other units will quickly follow ethylene into operation until the fully integrated plant is again turning out styrene for plastics.

An idea of the task the chemical engineers had to face can be gained from the fact that in the original plant there were 150 ft. high distillation towers, units, heaters, pumps, boilers, 50 miles of piping, 35 miles of copper tubing, 800 pieces of major equipment and more than 6000 delicate control and recording instruments. Completed in 1943, the plant had a former production capacity of 50,000 tons of styrene a year, a quarter of which went into the United States' war-time 800,000 ton synthetic rubber programme. One pound of styrene plus three pounds of butadiene combine to make four pounds of GR-s rubber.

Styrene is also the parent of a family of plastics, particularly polystyrene (Monsanto's Lustron), and in 1946 the company installed a \$1.5 million unit for Lustron.

FATAL EXPLOSION AT CHEMICAL PLANT

AN explosion, followed by a small fire, occurred in the Stratford works of Messrs. A. Boake Roberts and Co., Ltd., on Friday morning, last week. The plant concerned was working on the iso-eugenol stage of the vanillin process.

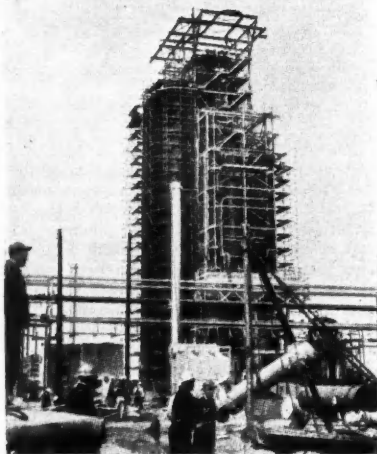
Five operatives working in the plant were injured, two seriously. These two men, Mr. C. H. Bruce and Mr. H. R. A. Eagle, were taken to hospital suffering from burns and shock. Bruce died the following day, Eagle was detained and is making satisfactory progress.

The effects of the explosion were confined to one room.

THE CHEMICAL AGE was officially informed on Monday that it was expected production would be resumed "in a few day's time."

Chemical Glassware at Copenhagen Show.

—A comprehensive range of laboratory apparatus and glassware will be shown at the British Exhibition at Copenhagen, September 18 to October 3, by Quickfit and Quartz, Ltd., the chemical glassware manufacturers, who are a subsidiary of the Triplex Safety Glass Co., Ltd.



This recent picture shows reconstruction work in progress at Monsanto's plant

High Pressure Hydrogenation

German Research & Industrial Practice

DESCRIBED by the author as "a chemical engineer's view of one phase of the process which was by far the main source of synthetic liquid fuels consumed in Germany during the war years," a comprehensive monograph report by Mr. Peter W. Sherwood, of the Mellon Institute for Industrial Research, Pittsburgh, Pa., on German research and industrial practice in the field of liquid phase high pressure hydrogenation of carbonaceous matter, has just been released by the U.S. Office of Technical Services, Department of Commerce. Used primarily as a first step in the production of petroleum, this hydrogenation process is versatile and permits the manufacture of fuel oils, briquetting agents, and the like.

Source of Aviation Fuel

The process, the report states, was an outgrowth of methanol and other high pressure studies carried on by Dr. Mathias Pier and his colleagues at the I.G. Farben laboratories, at Ludwigshaven. Hydrogenation of coal, tar and oil was the source of 97.5 per cent of German aviation petroleum and 47 per cent of all hydrocarbon products in Germany during the later war years. The first reported work on high pressure hydrogenation of carbonaceous matter was that of Bergius in 1911. The Bergius non-catalytic process continued until 1930, when it was displaced by the more successful catalytic process developed by I.G. Farbenindustrie under the leadership of Dr. Pier.

The report contains flow sheets for the hydrogenation of petroleum residue, brown coal, coal tar, and bituminous coals and pitches. The suitability of various raw materials for hydrogenation in the liquid phase is discussed in detail, as is the chemistry of coal hydrogenation. The chemistry of the liquid phase, thermodynamic efficiency of coal hydrogenation, effects of various catalysts on the liquid phase, influence of various conditions on the products, equipment used, control instruments, and methods of analysis are among the many subjects discussed in the report, which is also illustrated with diagrams, and numerous tables.

Copies of the 244-page report, No. PB-88839, entitled, "High Pressure Hydrogenation in Germany—the Liquid Phase," may be purchased for \$6.25 each from the Office of Technical Services, Department of Commerce, Washington 25, D.C., U.S.A.

Greasmaking Expedited

New Continuous Process

FOLLOWING several years' research and technological development to perfect a continuous greasmaking process, a new plant for large-scale production of lime soap greases¹ such means will shortly start production at the Baltimore refinery of Esso Standard Oil Company. Employing lime, animal or vegetable fats, and oil, the continuous process for making grease revolutionizes greasmaking because of its speed, its economical use of fatty ingredients and the uniformity of the finished product.

Several devices give the new continuous process its great precision and economy of operation, materials and time. One of the major achievements is the mixer, which blends soap and oil so well that less soap, in proportion to oil, yields an identical grade of grease. This permits the use of about 10 per cent less fat—an important saving when fats are scarce.

Production Accelerated

The key unit in the new process is a rapid soap cooker, which in 45 minutes completes the three-and-a-half hour job of the old pressure kettle. The rapid cooker consists of a heat exchanger and three tanks, each of which hold 2000 lb. of soap mixture. The raw materials, lime and fat, are pumped into the first tank, circulated through a heat exchanger and back into tank No. 1 until the soap is finished. Meanwhile, tank No. 2 is filled in readiness for cooking as soon as No. 1 is finished, and tank No. 3 is discharging soap into a mixer where mineral oil is added.

Automatic Control

The mixer, or disperser, is a system of loose gear revolving 3600 times a minute. Soap enters the mixer from the tank at one side, oil from the opposite side, and the two are blended amid cyclonic turbulence. The finished grease is steadily forced out of a filling pipe. Under the old system of greasmaking, packaging of the finished product could not begin until the entire batch had been completed. Now, because finished grease is produced as soon as the mixer starts to run, packaging is carried on simultaneously.

A pressure viscometer, continuously takes a tiny sample of the finished grease from the filling line. If there is any change in consistency, the instrument automatically operates valves which halt the mixing until the plant operator finds the difficulty and corrects it.

RECORD EXPORTS IN JULY

THE value of chemicals, excluding drugs and dyestuffs, exported from this country during July was the highest monthly total so far this year—£4,520,840, compared with £3,893,387 for June, the next best month. The latest issue of the *Trade and Navigation Accounts of the U.K.* (HMSO 4s. 6d.), in which these figures are published, also shows that July's total was over £500,000 more than the corresponding

accounting period of the previous year.

Generally, quantities of exports were above the preceding month and among the higher increases were ammonium sulphate, + 14,000 tons, bleaching powder, + 5000 cwt., cresylic acid, + 80,000 gallons, and tar oil, cresote, anthracene oil, etc., which were over 150,000 gallons higher. Sodium carbonate and potassium compounds also showed considerable increases.

CHEMICAL EXPORTS IN JULY

	July 1948 Cwt.	July 1947 Cwt.
Formic acid	2,172	1,749
Salicylic acid and salicylates	223,216	167,136
Tartaric acid	726	579
Value of all other sorts of acid ...	£26,990	£67,352
Aluminium oxide	414	437
Sulphate of alumina	2,179	2,348
All other sorts of aluminium compounds	619	345
Ammonium sulphate	38,126	38,553
Ammonium nitrate	7,042	709
All other sorts of ammonium compounds	1,335	1,083
Bleaching powder	33,386	46,374
All other bleaching materials	11,546	10,772
Calcium carbide	1,373	2,616
Benzol	3,266	6,853
Cresylic acid	276,938	240,333
Naphthalene	1,980	1,387
Tar oil, cresote oil, anthracene oil, etc.	3,102,099	9,302,061
Value of all other sorts of tar oil, etc.	£134,857	£35,188
Collodion cotton	1,781	1,917
Copper sulphate	2,038	4,583
Disinfectants, insecticides, etc. ...	85,194	63,986
Fertilisers	1,857	1,812
Glycerine	2,209	1,401
Lead acetate, litharge, red lead, etc.	12,406	3,039
Tetra-ethyl	65,375	106,171
Magnesium compounds	879	766
Methyl alcohol	10,788	193,365
Nickel salts	3,690	8,686
Potassium compounds	8,635	7,830
Salt	13,987	13,079
Sodium carbonate, etc.	432,545	233,935
Caustic soda	164,562	178,519
Synthetic sodium nitrate	—	21
Sodium silicate	18,388	9,114
Sodium sulphate	51,512	49,293
All other sodium compounds	96,461	72,276
Spirits refined	4,129	5,609
Cream of tartar	156	391
Tin oxide	661	1,325

	Tons	Tons
Zinc oxide	1,276	1,149
Total value of chemical manufactures, excluding drugs and dyestuffs	£4,520,840	£4,001,766
Quinine and quinine salts	199,340	262,106
Acetyl-salicylic acid	147,445	180,749
Insulin	1,600,312	706,218
Penicillin	422,897	124,771
Total value of drugs, medicines and preparations	£1,265,863	£1,584,161
Total value of dyes and dyestuffs ...	£694,467	£630,697
Total value of chemicals, drugs, dyes and colours	£7,581,387	£7,176,934
Plastic materials, other than casein and celluloid, etc.	35,249	26,341
Value	£427,866	£320,393
Chemical glassware	1,329	1,058
Value	£50,147	£43,797
Furnace plant	369	346
Value	£97,281	£63,169
Coal	1,263,738	66,658
Value	£4,717,558	£151,779

CHEMICAL IMPORTS

	July 1948 Cwt.	July 1947 Cwt.
Acetic acid	24,690	7,992
Boric acid	7,840	6,400
Tartaric acid	500	4,000
All other acids	3,006	3,261
Ammonium phosphate	—	3,300
Arsenic	1,230	297
Borax	17,728	14,800
Bromine and bromides	394	663
Calcium carbide	4,237	1,670
Coal tar products, excluding benzol and cresylic acid	11,821	1,001
Cobalt oxides	679	584
Fertilisers	5,203	847
Iodine	66,050	59,560
Potassium chloride	813,454	798,474
Potassium sulphate	50,900	30,480
Other potassium compounds	4,672	2,020
Sodium nitrate	—	19,940
Carbon black	67,044	75,260
Plastic materials, other than casein and celluloid, etc.	11,679	37,797
Total value of chemicals, drugs, dyes and colours	£3,143,125	£2,447,407

PERFORMANCE TESTS OF COATINGS

Scientific Estimation of Durability and Colour

From a Special Correspondent

AMONG the advanced equipment now being used for physically testing paint applications are devices for determining the adhesion and scratch hardness, flexibility, extent of protection afforded, and electronic colour matching, which have been developed during and since the war.

For adhesion and scratch hardness, one apparatus suffices for both tests. For scratch hardness, to the surface being tested a diamond-point cutting tool is applied by a lever arrangement carrying a beam and weight, the load being measured in grs. This is applied to the point, which moves across the surface at constant speed and cuts repeatedly in a fixed position until the sub-surface appears. A measure of the scratch hardness is obtained by the load on the beam, and the number of strokes required to wear through the film.

For accurately measuring the extent of adhesion of the film, this cutting arrangement is connected with a movable platform, which can be adjusted laterally by a notched wheel and precise screw thread. A standard stress is applied at progressively smaller spacings, until this is sufficient to displace the coating in the area between the cuts. That is the basis of the test. In this way, it is possible to ascertain the relative adhesion of a given coating to various sub-coatings and base metals, as well as revealing how varying conditions have affected the extent of adhesion by ageing, etc.

Flexibility and Extent of Protection

For determining flexibility, one post-war apparatus is mounted with an observation well in a vertical position and water is held by a hypodermic syringe in contact with the paint film being tested. Connected to a galvanometer are two wires, one of which is attached to the hypodermic needle and the other to the test panel. The latter is rigidly clamped and the machine is operated by a constant-speed drive which is geared to a thrust spindle of 3/16 in. diameter.

In this arrangement the paint film acts as an insulator, and when it fails an electric current is enabled to flow, as the water contacts the steel test panel. A galvanometer is deflected in this way, whereby the end-point of the test is indicated.

The thrust is measured in 1/100 mm. and a fixed table is used to convert this to percentage elongation, and in which way the points where failures occur after various degrees of exposure on identical panels are accurately recorded for comparison.

The panels used for both the adhesion determinations, and the flexibility test, approximate to 6 in. by 4 in., and the apparatus in each instance does not cover more than 1 sq. ft. of bench area.

For indicating the protective value of metal finishes, a further improved measure is to apply thin uniform films to sheets of iron foil which are approximately 2/1000 in. thick. When the test panels are exposed to accurately controlled humid atmospheres in the laboratory, rusting takes place rapidly underneath the thin paint film. This stimulates what would occur in service conditions with structural steel, and the time which elapses before rust spots appear indicates the degree of protection which the paint under test affords. While this technique does not permit dispensing with existing test methods, it acts as a reliable supplement.

Electronic Colour Matching

The photo-electric spectrophotometer was first introduced towards the latter stages of the war, its special use then being to match camouflage colours so that infra-red cameras used by enemy observers would fail to detect them. (Due to the different amounts of infra-red received, two objects, which to the eye have the same colour, may photograph differently.)

The spectrophotometer gives a measure of both visible and invisible colour, as this determines the amount of light, or infra-red wavelength, which is absorbed by any paint. To-day, the apparatus is engaged to establish the colour for all descriptions of paints, enamels, and finishes, and takes the form of an electronic device.

This changes colour matching from an ordinary testing art to an exact science and, besides providing a permanent record, obviates the need for standard colours for each determination.

The essential features of the device are a monochromator, a photo-electric photometer, and a recorder, where white light is first spread into spectrum colours by one prism and amplified by another prism. Monochromatic light passes through two Rochon prisms and a Wollaston prism, which collectively generate two beam components, while a photo-tube takes a view from a frosted glass.

Discolorations of organic finishes, and the effects of heat, light, humidity, grease, and ultra-violet radiation, etc., can also be accurately confirmed for future comparison by this system of colour matching.

AMERICAN COMMERCIAL PLASTICS

Practical Progress Reported at ACS Congress

THE papers presented at the 114th national congress of the American Chemical Society covered subjects as widely divergent as plasticisers and crop-protecting chemicals.

Mr. W. A. Woodcock, of the Carbide and Carbon Chemicals Corporation, New York City, said that production of plasticisers was nearing an unequalled high level of 200 million lb. this year. This development, he said, was a corollary of the tremendous expansion of the plastics market since the war, pointing out that the type of plasticiser employed was primarily responsible for the specific properties of various plastics, such as heat stability, oil resistance, and flexibility at low temperatures.

As an example of the progress made in the plasticiser field in recent years, Mr. Woodcock recalled that shower-bath curtains made in the late 1930's employed too volatile plasticisers, resulting in premature losses which made the curtains stiff. "Another plasticiser was used and this cut down the volatile losses," he said. "But it was found then that the portion of the curtain most often in contact with water became stiff, although the rest of the curtain was pliable. A third plasticiser was used and found satisfactory in volatility and water resistance, but then it developed an obnoxious odour in storage. These principal deficiencies have been corrected now with the modern vinyl shower-bath curtain."

Improved Pliability

New demands were creating new and better plastics, Mr. Woodcock said, adding: "Progress in solving this problem has been relatively rapid in spite of the complicating limitations imposed on each product." The industry, he pointed out, only last winter found that it must consider properties desired between processing and use. Some butchers' aprons, he said, were made up with an experimental plasticiser of the polyester type. They were intended for indoor use and consideration for low temperature flexibility had not been a prime consideration. When they were distributed during one of the colder spells they fell to pieces.

A plasticiser called trioctyl phosphate, or "TOF," was developed which was very effective in lowering the brittle temperature and developing excellent pliability, Mr. Woodcock said. "Through the judicious use of mixtures of plasticisers," he continued, "it has become possible to correct the individual product deficiencies. The art of such mixtures is only now developing but

very definite progress has been noted. One of the reasons for the rapid advance in plasticiser developments is the close technical relationship between user and supplier. The old tendency to put products into general bins of stated character is slowly disappearing. More and more the suppliers are recognising the specific nature of each type of product made."

Adapting War Chemicals

At another section of the Congress, Raymond C. Crippen and Mr. Leonard Buchoff, of Penniman and Browne, Inc., Baltimore, reported that a chemical used during the war to make mustard gas had been adapted to a peacetime rôle in protecting crops, and added that they had found other uses for the chemical thiodiglycol in the manufacture of resins, plastics, oils and petroleum. The research chemists reported that "sticking" agents were prepared from the chemical for insecticides and fungicides which mixed with water and then "stick" longer when they were sprayed to protect crops. Thiodiglycol was similar to a combination of ethylene glycol ("prestone") and sulphur. It was a thick, water-soluble, amber fluid which did not boil under 330°F., and also gave protection against freezing down to 10°F. There were large quantities of the compound available in storage.

Another chemical used during the war was now being employed as a fertiliser for seedlings and as a feed supplement. It was green manganous oxide which was used as a flux in welding light metals. Other uses which had been discovered for this oxide were as an ingredient in welding rod castings, as a "trigger" for organic reactions, as a primer pigment for paints, and as a paint drier. It was found especially adaptable in agriculture, since it dissolved slowly in the soil and did not produce toxic concentrations. Noting that manganese was essential to reproduction and to life itself, and that it worked with iron, the researchers added that "perhaps doctors will prescribe it in the future as well as iron for anaemia."

New U.S. Tanker Service For Chemicals.

—The Celanese Corporation of America has announced the completion of tanker facilities for the shipment of bulk chemicals from its chemical plant at Bishop, Texas, to the Eastern seaboard. This tanker service combines the most modern marine equipment with new chemical control technique and represents the first tanker movement of bulk formaldehyde in the country.

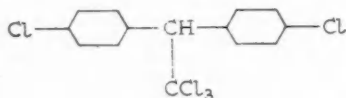
The Trichloro Group in DDT

Probable Basis of Insecticidal Potency

by R. W. MONGRIEFF, B.Sc., F.R.I.C.

THE outstanding efficacy of DDT as an insecticide and as a means of destroying body lice has led naturally to an investigation to determine to what structural features of its molecule its remarkable powers are due.

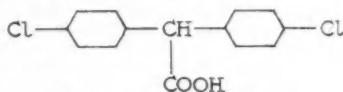
The structure of DDT itself is familiar to most. Its systematic name is *pp'*-dichloro- α - α -diphenyl- $\beta\beta\beta$ -trichloroethane and its structure is:—



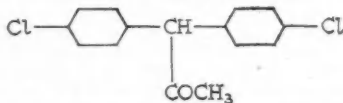
A first inspection of the molecule would hardly lead one to suspect that it would have any unusual properties, although on giving the matter closer thought one is struck by the high chlorine content which is typical of many moth-proofing agents, notably the Eulans of I. G. Farbenindustrie A.G. and Lanoc C.N. just recently introduced by the I.C.I., as well as Mystox B in which the active agent is pentachlorophenol. Another feature which may be noted in the structure of DDT is the presence of the trichloro-group C Cl_3 , the same group as constitutes practically the whole of the chloroform molecule CH Cl_3 .

The idea has been put forward by Luger, Martin and Muller that the potency of DDT is due to a combination of the toxicity of the bis (chlorophenyl) methane system and of the inhalation-anæsthetic group— C Cl_3 . If this were true it would be expected that substances otherwise similar in constitutional features to DDT but in which the —C Cl_3 group had been replaced by other groupings would not exhibit the extreme toxicity to insects which is characteristic of DDT itself.

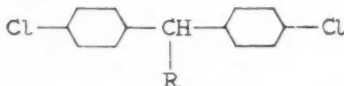
Very recently publication has been made of the results of work directed to this end. Two compounds generally similar in structure to DDT but lacking the —C Cl_3 were prepared and their toxicity towards insects evaluated. The work is described by Erlenmeyer, Bitterli and Sorkin² in a very recent issue of *Helvetica Chimica Acta*. The two substances prepared were *pp'*-dichlorodiphenyl-acetic acid:—



and *pp'*-dichloro- α -diphenylacetone:—



It will be seen that both these substances and DDT itself may be written in the general form:—



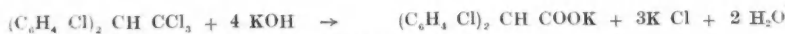
where R is respectively —COOH , —COCH_3 and —CCl_3 , and if, therefore the properties of DDT itself are specifically due to the presence of the —CCl_3 group these other substances should be very much less potent.

Preparation of Dichlorodiphenyl-acetic Acid

The acid was prepared from DDT itself by hydrolysis with alcoholic potash in an autoclave. Such severe conditions are necessitated by the stability of DDT to chemical reagents, a feature which was noted in 1874 by the German student who first prepared it as part of his work for his degree thesis, a feature which made him consider his new product uninteresting from a chemical standpoint and apparently dissuaded him from continuing an investigation of its properties. So easily are chances missed; had the discovery of its insecticide properties been made then the course of history would have been changed, for the louse has lost more campaigns than any general.

The hydrolysis was carried out as follows. Thirty grams of DDT and a solution of 80 g. potassium hydroxide in 540 c.c. ethyl alcohol were heated together in an autoclave at $100\text{--}110^\circ\text{C}$. for 80 hours. The mixture was poured into 2 litres of water and the solution boiled in animal charcoal and filtered. The filtrate contained the potassium dichlorodiphenyl acetate and on acidification with 50 per cent sulphuric acid this was converted into the required acid and on recrystallisation from 80 per cent ethyl alcohol a

purified product was obtained melting at 165-166°C. The yield was 18 g., i.e., 76 per cent of theory. It is interesting to note that the hydrolysis of the DDT to the potassium salt of the acid may take place in two ways, (1) direct hydrolysis:—



or (2) through the intermediate formation of an olefine,



For purposes of identification and characterisation the acid was converted into its ethyl ester. Esterification was accomplished by heating 4.2 gr. dichlordiphenyl acetic acid with 25 c.c. absolute alcohol and 1.0 c.c. sulphuric acid for three hours. This gave 3.5 gr. (76 per cent yield of theory) ethyl dichlordiphenyl acetate which was purified by recrystallisation from absolute alcohol and then melted at 87.5-88°C. Elementary analysis of this product established its identity:—

$(C_6H_4 Cl)_2 CHCOOC_2H_5$ is $C_{16} H_{14} O_2 Cl_2$ which requires 62.11 per cent carbon (62.21 per cent found) and 4.56 per cent hydrogen (4.75 per cent found).

Biological Properties of the Acid

The biological testing of the dichlorodiphenyl-acetic was carried out by Ciba, Ltd., and resulted as follows:—
Towards the housefly *Musca domestica*. A very weak toxicity was shown.

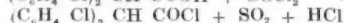
Towards the moth *Tinea granella*. No action.

Towards the beetle *Dermestes frischii*. No action.

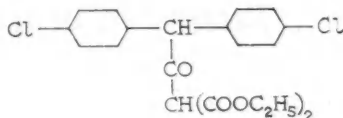
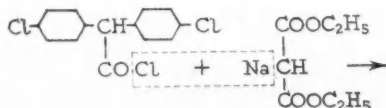
Preparation of *pp'*-Dichloro- α -diphenyl acetone

The preparation of this substance from DDT itself was accomplished in the following steps.

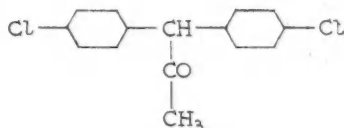
(1) DDT was converted into dichlorodiphenyl acetic acid, as already described, and this was reacted with thionyl chloride under reflux for three hours to give the acid chloride



The acid chloride was reacted with malonic ester and sodium benzene:—



and on hydrolysis this gave the corresponding ketone



This compound has the empirical formula $C_{15}H_{12}OCl_2$ which requires carbon 64.53 per cent (64.25 per cent found) and hydrogen 4.33 per cent (4.70 per cent found).

Biological Properties of the Ketone

Tested by Ciba, Ltd., the dichlorodiphenyl acetone was found to be useless against the housefly, the moth and the beetle, insects similar to those that had been used for testing the corresponding acid.

Compounds similar to DDT but in which the $-CCl_3$ group has been replaced in the case of an acid by the $-COOH$ group and in the case of a ketone by the $-COCH_3$ group have been prepared by Swiss workers.

These compounds known respectively as *pp'*-dichlorodiphenyl-acetic acid and *pp'*-dichloro- α -diphenylacetone fail to show any effective insecticidal activity and it appears therefore that DDT owes its potency at least in part to the presence of the $-CCl_3$ group. This group which occurs also in chloroform and in chloral hydrate may be responsible for an inhalation-anæsthetic effect and this property combined with the toxicity of the dichlorodiphenyl methane residue in DDT may account for the high potency of this substance.

References

1. P. Luger, H. Martin and P. Muller. *Helv. Chim. Acta*, 27, 892-928, (1944).
2. H. Erlenmeyer, P. Bitterli and V. E. Sorkin. *Helv. Chim. Acta*, 31, 466-470, (1948).

Trends in Horticultural Chemistry

Functional Studies of Copper and Chlorine

ALTHOUGH the cupric ion will kill many types of fungus spores, soluble copper salts cannot be used as protective fungicides on plants owing to their marked phytotoxicity, stated Dr. R. L. Wain in the course of a lecture entitled "Recent Developments in Horticultural Chemistry," which he delivered recently at Wye College before the London and South-Eastern Counties Section at the Royal Institute of Chemistry, and of which the following is a summary. For such purposes, said Dr. Wain, sparingly soluble copper compounds like Bordeaux mixture are used. The dried deposit of this excellent fungicide yields only 0.5 p.p.m. of copper to water and since this concentration is insufficient to kill most fungus spores, it would appear that there are other agencies operative in bringing copper into solution. That carbon dioxide in the air or excretions from the sprayed leaf might be important factors is disproved since Bordeaux deposit on glass is fungicidal in atmospheres free of carbon dioxide. On the other hand the fungus spore itself has been shown to exude substances capable of dissolving copper from Bordeaux, an effect which Wain and Wilkinson proved could only occur through complex ion formation.

The results of a chemical investigation of the exudate from 8×10^{12} fungus spores, and those of a series of solubility determinations enabled these workers to suggest a mechanism for the fungicidal action of copper which has led to the possibility of assessing fungicidal value by chemical means.

The hypothesis of Martin and Wain to explain the contact insecticidal action of DDT is based on a study of DDT analogues in which the central $>\text{CH}-\text{CCl}_3$ grouping and the *para* nuclear substituents

have been modified. The fact that DDT loses HCl readily to produce a non-insecticidal ethylene derivative indicates that the $>\text{CH}-\text{CCl}_3$ grouping is the toxophore. Modification of this affects insecticidal activity and it was found that when HCl elimination is impossible, as for example with $>\text{CH}-\text{CH}_3$ or $>\text{CCl}-\text{CCl}_3$, the substance was non-insecticidal. The chlorophenyl groups would seem to assist penetration of the molecule as a whole to its site of action on the nervous tissue of the insect for replacement of the *para* chlorine atoms by more polar groupings such as hydroxyl destroys contact insecticidal action. Symmetry in the DDT molecule is also important, this no doubt enabling more facile orientation of the molecule at the sensitive orientation of the molecule at action, $p,p'>m,p'>o,p'>o,o'$.

The properties and insecticidal action of benzene hexa-chloride are in accordance with the HCl theory, for example, the almost non-insecticidal β -isomer loses HCl with difficulty whereas the highly active γ -isomer is most readily dehydrochlorinated. The hypothesis has also proved most useful in the search for new contact insecticides as is shown for example by the discovery of chlordane, $\text{C}_{10}\text{H}_6\text{Cl}_8$, by American workers.

The study of plant growth-regulating substances has opened up wide fields of research from which applications of considerable horticultural importance have developed. An account was given of recent work carried out at Wye on the effect of synthetic chemicals on the healing of wounded plant tissue, production of seedless fruit, rooting of cuttings and the inhibition of bud burst in fruit trees.

India and Pakistan to Exchange Chemicals

CHEMICALS and pharmaceuticals figure prominently in an agreement between India and Pakistan for the mutual supply of certain essential commodities. Supplies will ordinarily be made through normal commercial channels during the period of the agreement which will be one year from July 1 last.

India has agreed to supply Pakistan with 270 tons of hydrochloric acid, 200 tons of nitric acid and 800 tons of magnesium sulphate. Other Pakistan requirements, which include 2000 tons of sulphuric acid, 2000 tons of aluminium sulphate and 400 tons of ferrous sulphate, are to be examined in Delhi.

In return, Pakistan has agreed to supply

India with the 2 million mds. of rock salt, and the 5000 tons of potassium nitrate requested. India also listed 10,000 tons of soda ash among her requirements. The Pakistan factory is at present closed, but is expected to get into normal production by the end of this year. It is hoped to meet India's demand in 1949.

India and Radioactive Isotopes.—It has been decided that all matters connected with the procurement of radioactive isotopes are to be handled in India by the Board of Research on Atomic Energy in consultation with the Department of Scientific Research.

HIGH STRENGTH HYDROGEN PEROXIDE

The British Double Distillation Process

by V. W. SLATER and W. S. WOOD

THE British method⁷ of producing high strength H_2O_2 is a double distillation process wherein the 35 per cent hydrogen peroxide is first purified and fractionated to a 70 per cent solution and is then redistilled and fractionated to give a pure 90/92 per cent product.

In the first stage the 35 per cent solution is fed to an externally heated vertical tube, and the mixture of vapour and liquid passes into a separator from which the vapours pass to a fractionating column, while the liquid goes to a reservoir connected to the bottom of the vertical evaporator, thus forming a closed cycle with the bulk of the liquid kept unheated in the reservoir. The fresh 35 per cent solution is fed continuously to the vertical evaporator and the strength of the hydrogen peroxide in the cycle builds up to an equilibrium such that the strength of the vapour produced is equal to the strength of the feed peroxide.

The second stage is of similar design to the first and is connected directly to the supply of liquor coming from the fractionating column of the first stage. In this

second closed cycle the concentration builds up so that the strength of vapour produced may be fractionated to give hydrogen peroxide of 90 per cent or higher strength.

High Strength H_2O_2

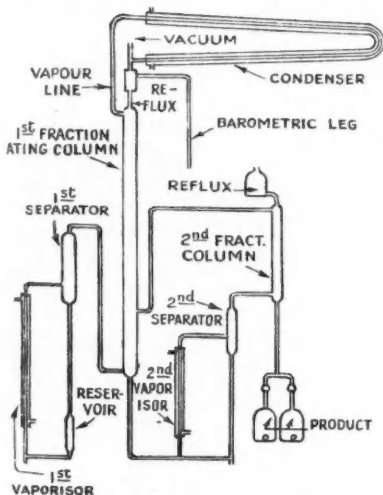
The term high strength hydrogen peroxide usually refers to solutions containing at least 70 per cent by weight H_2O_2 , and in fact, more usually to 80 per cent H_2O_2 . It is a clear colourless free-flowing liquid, resembling in appearance, say, accumulator acid.

The two properties which are of particular value are its considerable heat of decomposition which can be readily made available by simple catalytic decomposition and its high oxidising power which may produce considerable energy during the oxidation or combustion of organic compounds and certain inorganic compounds, such as hydrazine hydrate.

The decomposition can be readily demonstrated by pouring a very fine stream of the high strength solution on to a few crystals of potassium permanganate contained in a conical flask when, with 70 per cent solutions, all the hydrogen peroxide added is completely vaporised, while with higher strengths the steam produced is superheated.

The ignition of organic material can also be simply demonstrated by adding a drop or two of 80/90 per cent hydrogen peroxide on to a piece of cotton cloth, with and without a trace of iron rust on the cloth. The ignition of the clean cloth is usually delayed for some minutes, whereas the dirty cloth ignites almost immediately.

It will be of interest to note the available oxygen which can be obtained from various strengths of hydrogen peroxide as well as the heat developed. As is well known, one atom of oxygen is given up by the decomposition of one molecule of hydrogen peroxide and, according to Matheson and Maass,⁸ the decomposition of one gram molecular or liquid hydrogen peroxide into water and gaseous oxygen at atmospheric pressure liberates 23,450 calories of heat.



The British process in diagram

The first part of this paper, reproduced by courtesy of the authors and of Laporte Chemicals, Ltd., and the British Interplanetary Society, appeared in THE CHEMICAL AGE, August, 28.

TABLE I.

H_2O_2 per cent. wt/wt.	Available Oxygen per cent.	Heat of decomposition K.cals/Kg.	B.Th.U./lb.
100	47.04	690	1241
90	42.43	621	1117
80	37.63	551	993
70	32.93	483	860
30	14.11	207	372

Table 1 shows the oxygen content and heat of decomposition for various strengths of hydrogen peroxide. It illustrates the high available oxygen content of solutions which can be transported in comparatively simple light-weight equipment.

The high heat of decomposition is of value in that it enables high strength hydrogen peroxide to be used as a convenient source of superheated steam. This is illustrated in Table 2 which gives the approximate temperature of the mixture of superheated steam and oxygen formed by the complete decomposition of various strength solutions of hydrogen peroxide.

It allows the production of high pressure steam in small units, and a particularly good example of this is the turbine used for driving the pumps for the V.2 rocket weapon. This application was dealt with recently in a paper given by H. Wheeler⁹ to the Institution of Chemical Engineers in March, 1948.

TABLE 2.

H ₂ O ₂ per cent. w/w	Approximate temp. of vapour °C.
100	940
90	700
80	450
70	200
30	90

Density and Concentration

It is necessary in considering the application of hydrogen peroxide to have some knowledge of the relation between density and concentration. The density of various concentrations has been determined by a number of workers of which perhaps the best known results are those by Maass and Hatcher.¹⁰

Table 3 gives figures determined in our laboratories (Laporte Chemicals, Ltd.) on the product as manufactured. The table also includes the older method of expressing the concentration of hydrogen peroxide as volume strength, which is based upon the volume of oxygen obtained at normal temperature and pressure from unit volume of the solution.

TABLE 3.

H ₂ O ₂ per cent. wt/wt.	H ₂ O ₂ per cent. wt/vol.	Volume Strength	Specific Gravity	Approx. lb./gal.
100	144.5	479	1.456	14.6
90	126.5	418	1.404	14.0
80	108.0	358	1.349	13.5
70	90.2	300	1.296	13.0
30	33.6	110	1.112	11.1

The density figures may be affected, of course, by the purity and the quantity of stabilisers added to the hydrogen peroxide, but the solutions as now manufactured do not contain many impurities and do not require excessive quantities of stabilisers so that the densities should not differ very much from those given.

The freezing point of hydrogen peroxide solutions depends upon the concentration and it is of importance to know its value should it be required to be used in extremely cold climatic conditions. Perhaps the most acceptable results are those of Giguère and Maass,¹¹ whose figures for higher strength solutions are given in Table 4.

TABLE 4.

H ₂ O ₂ per cent. wt/wt.	Freezing point °C.
100	- 0.89
90	- 11
80	- 23
70	- 39.5
30	- 25

The vapour pressure of solutions of hydrogen peroxide has been determined by Giguère and Maass;¹² the figures in Table 5 were determined in our laboratories. This table shows that solutions of high strength hydrogen peroxide are hygroscopic and, in fact, under normal conditions in this country, solutions of 30/40 per cent hydrogen peroxide may also absorb water.

TABLE 5.

H ₂ O ₂ per cent. w/w	Vapour Pressure at 15 C. mm. Hg.
0.0	12.9 ± 0.1
10.05	12.1 "
20.25	10.9 "
30.5	9.8 "
38.8	8.45 "
49.65	7.0 "
60.4	5.45 "
70.55	4.05 "
79.7	2.8 "
90.05	1.65 "
99.0	1.0 "

The vapour in equilibrium with the higher strength solutions of hydrogen peroxide contains a high percentage of hydrogen peroxide, as is shown by the figures obtained by Giguère and Maass¹² (Table 6).

Another physical property which plays a part in the application of hydrogen peroxide is the viscosity of the solution. This property has been determined

TABLE 6.

H ₂ O ₂ per cent w/w in liquid and vapour phases at 45°C.	Liquid	Vapour
15.7		0.9
32.6		1.7
43.5		4.5
53.6		9.1
65.3		15.8
73.9		31.3
85.1		48.8
92.4		73.1
92.7		75.2
95.2		83.3

by Maass and Hatcher,¹⁰ and Table 7 shows that the viscosity increases slightly with increased concentration, but hydrogen peroxide cannot be considered to be viscous at even the highest concentration.

TABLE 7.

H ₂ O ₂ Per cent w/w.	Viscosity (18 °C.) Poise
0.00	0.01054
11.21	0.01066
34.05	0.01157
68.50	0.01285
83.15	0.01300
89.47	0.01301

Of the other physical properties, mention may be made of the following:

The specific heat at constant pressure of 100 per cent H₂O₂ liquid is equal to 0.579 cal., per gram.¹⁰

The boiling-point of 90 per cent H₂O₂ is of the order 140°C.

The surface tension varies only slightly with concentration and according to Maass and Hatcher,¹⁰ is equal to 75.67 dynes/cm. for 90.66 per cent solution.

Stability

The stability of hydrogen peroxide, particularly the high strength material, is obviously of paramount importance. The subject is more complex than may be considered at a first glance, since the stability is affected by a number of factors, two or more of which may be operating simultaneously.

The main factors which affect the stability of hydrogen peroxide solutions are as follows:

- The purity of the solution as judged by the presence of positive catalysts in solution.
- The decomposition due to the reaction at the surface of the containing vessel.
- The photochemical decomposition, matter in suspension.
- The acceleration of the decomposition by increasing temperature.
- The photochemical decomposition.

The first of these factors is probably the best known cause of decomposition. The most active catalysts are certain cations, although with some pure solutions the presence of relatively large concentrations of anions also deteriorates the stability.

Of the cations which have a pronounced de-stabilising effect on hydrogen peroxide the most active are iron, copper and vanadium, while nickel, chromium, manganese and certain others have an appreciable effect, although not so marked as the first three mentioned.

In the most active group, the activity of the catalyst is measurable down to quantities of the order a few parts per 10 millions and even a few parts per 100 millions. It is doubtful whether solutions containing these minute traces of active catalysts can be sufficiently stable without addition of certain other substances known as stabilisers, or negative catalysts.

The actual mechanism of the decomposition by these positive catalysts is not completely understood, but it is significant that cations with more than one valency usually have some degree of activity.

There are certain cations, for example those of the alkali metals, sodium and potassium, which appear to have little or no effect on the stability of the solution and under some conditions, certain cations are even said to have stabilising properties. Further, it should be remembered that probably the most important stabiliser or negative catalyst is the hydrogen ion, while one of the most active destabilisers or positive catalysts is the hydroxyl ion.

It is usual for anions to deteriorate the stability unless present in relatively large concentrations and, in presence of excess H ions, *i.e.* relatively high acid solutions. Some anions are stabilising substances, *i.e.*, phosphates.

The second cause of decomposition is that due to the heterogenous reaction, *i.e.* the decomposition which takes place on the surface of the containing vessel. The degree of decomposition on surfaces differs considerably with the composition of the surface, *i.e.* type of material and also the condition of the surface. Some materials are more active than others in promoting decomposition; a smooth surface is generally less active than a rough surface.

The amount of decomposition is related to the area of the surface, and therefore it is usual to express the decomposition in terms of H₂O₂ decomposed per unit area in unit time at a standard temperature.

(To be continued)

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- To be published in the *Journal of the Institute of Chemical Engineers.*
- Maass and Hatcher, *J.A.C.S.*, 1920, 42, 2548.

Reinforced Aluminium

An ex-officer of the Italian army, Gino Pellegri, has invented a new product which he calls "reinforced" aluminium. It consists of fusing a steel network or a similar structure into aluminium. Aluminium sheets thus prepared are said to possess a strength equal to that of some grades of steel. Given the great range of the possible applications of the new product and the fact that Italy has high capacity for the production of aluminium, it presents considerable advantages for the country. The cost of "reinforced" aluminium is stated to be 35-50 per cent of that of steel.

American Chemical Notebook

From Our New York Correspondent

A NEW method to identify and to determine quantitatively the synthetic estrogens has been worked out by Dr. Sidney Gottlieb of the Food and Drug Administration, Federal Security Agency, Washington 25, D.C. (*Journal of the American Pharmaceutical Association, Scientific Edition*, 36: 379, 1947). Since the synthetic estrogens were accepted in therapy, many derivatives of the 4,4 stilbenediol series have become available. This development has brought a need for a reliable and widely applicable method for chemical determination of synthetic estrogens. He reports a method that depends on the formation of nitrosophenols from diethylstilbestrol, hexestrol, dienes-trol, benzestrol and Meprane. The procedure distinguishes individual estrogens among this group of compounds and determines each compound quantitatively. The presence of the natural estrogens, estrone and alpha-estradiol, does not interfere with the determination.

* * *

What appears to be a very thorough and authoritative presentation of problems in die-casting and of the characteristics and applications of various die-casting alloys has been issued by Federal Metals Division of the American Smelting & Refining Company, 120 Broadway, New York 5. "Die Metal for Better Diecastings," offers an informative exposition of the nature of die-casting, diecasting processes, the selection of alloys, general metallurgy of alloys, effects of impurities, the melting of the metals, and many other essentials. There are also tables of specifications, a chart on composition of steels for dies, and a table of dimensional and weight limits for diecasting of various alloys.

* * *

The Igard Corporation of America, 146 East 35th Street, New York City, has been established by the Combined Optical Industries, Ltd., of London, to handle American sales of plastic ophthalmic lenses and other optical products manufactured by the parent British company. The lenses will be marketed in all regular prescriptions through dispensing opticians to the public and also will be available for industrial safety goggles. The lenses are said to be unbreakable, lighter than glass, and capable of resisting the "fogging" commonly associated with ordinary eyeglasses. Mr. Gordon F. Ives, formerly manager of the import division of Westinghouse Electric International Company, is president of the new corporation.

The Nelson L. Davis Company of Chicago, designers and suppliers of coal processing equipment for F. H. McGraw and Company, constructors and engineers, has developed a new coal cleaning process which, it is claimed, will separate metallurgical coal from steam coal. The process is reported to separate the two types of coal by means of a sink and float principle. According to Mr. Clifford S. Strike, president of the McGraw organisation, the new process will mean a considerable saving to coal producers and an even greater saving to steel makers because of the reduction of sulphur which eventually gets to the blast furnaces.

* * *

Indications are that the available supply of steel for the fourth quarter in the United States will be about 10 per cent less than in the third quarter, and supplies may be further reduced after October if conditions warrant such action. Scrap is short, and most mills feel they have insufficient supplies on hand for the winter, when gathering, processing and grading are often restricted by the weather. Representations have been made by the American authorities in Germany that an agreed price should be paid by both Britain and the U.S. for the German stocks of steel scrap acquired, following the expression of belief by U.S. Government officials that \$26 a ton is enough, whereas Britain was thought to be willing to pay as much as \$30 with a view to expediting delivery.

* * *

The U.S. and Britain have been tentatively allocated 240,000 tons each of scrap from Germany for the last six months of the fiscal year ending June 30, 1949, and a total allocation of 420,000 tons has been set for other Western European countries. This scrap, in the form of ruined Nazi equipment, such as bridges, tanks and building frames, is needed by American steel mills to step up their output. An American Government and industry committee, recently returned from a tour of Germany, estimated that up to 10 million tons of steel scrap were available in the Western zones.

* * *

The Mexican Gulf Sulphur Company, of New York, have entered into an agreement with the Jefferson Lake Sulphur company to explore further and develop the former company's sulphur properties in Mexico. Four wells are to be drilled, and next year one of the Jefferson Lake sulphur plants, capable of producing 1500 tons daily, will be re-erected in Mexico.

Metallurgical Section

Published the first Saturday in the month

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Metallurgical Section

4 September 1948

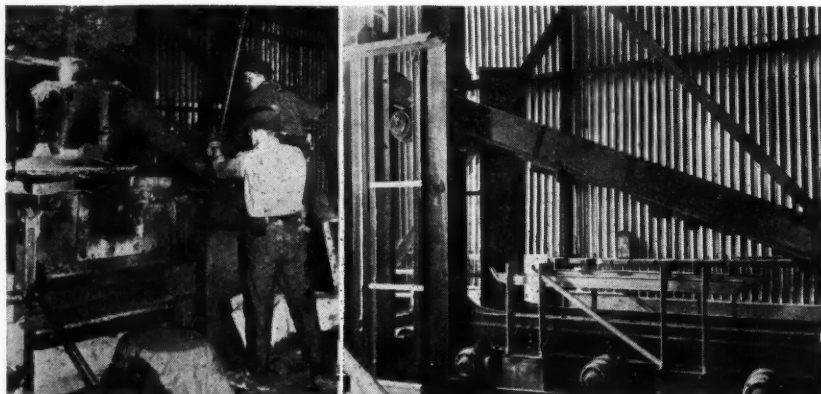
THE CONTINUOUS CASTING OF STEEL Semi-Finished Shapes in One Machine Process

THE idea of cast steel articles being made from the liquid phase to semi-finished shape in one simple, relatively inexpensive machine, has been brought to reality through a joint development of the Republic Steel Corporation and the Babcock and Wilcox Tube Company, both firms announced recently. Plans to licence other steel companies to use the newly developed machine, which allows molten steel to be cast into semi-finished shapes without resorting to ingots or blooming mills, are being completed by the Babcock and Wilcox Tube Company, co-discoverers of the process.

In disclosing the new development, both companies said that the continuous casting of semi-finished steel, now made possible with the new method, would open up possibilities of the utmost importance to the entire steel industry through increasing productivity and decentralising production by simplification of apparatus and increasing the final yield of steel from the original melt. The new method and apparatus are considered a timely response to great economic pressure to serve areas locally.

The greatest single advantage of this process, according to the announcement, is that it removes from the conventional process of steelmaking the most massive and expansive parts of the plants, such as equipment for ingots, soaking pits, and the blooming mill. Instead, continuous casting permits passing directly from the melt to semi-finished sections ready for secondary mills, with the result that not only is the capital cost for a given output greatly reduced, but also maintenance and operational costs. The work accomplished to date makes it clear that for the production of relatively small quantities of steel, and particularly as a means of decentralising steel production, this new development exactly fills the requirements of low capital and low operational costs.

The Republic Steel Corporation first attacked the problem of continuous casting of steel some six years ago, and for several years now the participants in the new development have been casting experimental runs of carbon and alloy steel billets. In March of this year, the first continuously cast steel for conversion into commercial



Molten steel from a standard electric furnace is conveyed to the top of a tower and transferred to an induction furnace, (left—"Iron Age" photo); the cradle in which the formed billet is received at the base of the tower

products was made at Beaver Falls, Pennsylvania. Forty-five tons of 0.15 C steel was shipped to a commercial user. More recently, continuously cast slabs have been rolled into strip. This strip has been converted to electric-welded boiler tubes meeting all of the physical requirements of the company's regular product.

Although continuous casting of non-ferrous metals has been routine industrial practice for the past ten years, when attempts were made to apply the process to steel the problems were multiplied. The metal temperature is far higher and the erosion, segregation, slag inclusion and safety factors are constantly present and very troublesome. The Beaver Falls unit of Babcock and Wilcox has solved these factors in a relatively simple piece of equipment, and it is to be expected that the steel industry eventually will find continuous casting as much an essential part of its operations as does the non-ferrous industry.

Production Methods

At present the Beaver Falls unit casts two or three times per week, handling both carbon and alloy steels. A section of about 30 sq. in. has been used in this work and is satisfactory for commercial use at a rate of 400 lb. a minute. It is expected that continued work on this section will add considerably to the rate. A mould for cross-section of about 45 sq. in. is now under construction. This unit is located at the top of a 75-ft. tower, to which steel is delivered from the company's regular electric furnaces and is lifted to the top of the tower in a transfer ladle. There it is poured into an inductively heated holding and pouring ladle. By watching the liquid steel in the mould by a mirror arrangement, the operators can see at all times whether the liquid surface is clean and the process functioning properly. Shortly after the shell of the billet has been formed, the steel contracts and in so doing the billet shrinks away from the mould. The metal, therefore, is in contact with the surface of the mould for only a few inches, and only in this short distance can it lose heat to the mould by direct contact.

Proper cooling of the mould is essential and its importance increases as the casting rate is raised. The more rapid the casting rate, the greater the quantity of heat which must be absorbed by the surface of the mould. It was found that a number of metals performed almost equally well as a mould material. The Babcock and Wilcox Tube Company has used 1-16 in. steel, $\frac{1}{2}$ in. copper and 3-16 in. brass. It has been found that brass has definite structural and fabrication advantages.

Since continuous casting requires a slag-

free steel, the steel is poured from the holding furnace into a tundish designed to strain out the slag. From the tundish the steel flows into the mould. A pre-heated tundish has been used, but a specially designed electrically heated one will be installed. Below the mould, the casting passes through an insulated chamber which arrests and controls the speed of further cooling. Below this chamber is the withdrawal mechanism regulating the speed of movement of the steel billet. The casting then passes an oxy-acetylene torch which travels down the billet a short distance while the billet is being cut to specified length, which can be as much as 35 ft. The cut-off section of billet is lowered to a horizontal position by a cradle arrangement.

Results at Beaver Falls have indicated that ovals of special properties are the most practicable cross-section to cast continuously. These ovals will readily go into a rolling mill for shaping into rounds, or can be rolled into flats. Continuous casting meets fully established criteria of sound steel making practice, it was stated, and has certain advantages over the conventional method. It allows faster cooling, which results in a fine and uniformly crystalline structure with very little segregation. It offers less opportunity for dirt or other foreign material to enter the castings and, in general, the surface of the ingot will be freer of checking and scabs, and its interior free of entrapped slag.

Flexibility of the heat withdrawal pattern makes it easier to solidify the steel in the mould progressively from the bottom to the top. Although the mould is of uniform cross-section it approximates in behaviour the big-end-up mould—the type used for best quality steels. Ingots made by this method are cooled quickly and therefore tend towards a fine grain rather than a columnar crystal structure. The billets may be as long as desired and have no taper.

Substantial Saving

Babcock and Wilcox and Republic Steel Corporation spokesmen estimate that the new process will provide savings of at least \$3 a ton in the production of steel and will increase production substantially. The special machine, still unnamed, was termed a device "big enough to put into an ordinary family garage, in contrast to the tremendous equipment" it is capable of replacing. While no estimate of the cost of the new machine was given by the inventors, the companies said that such cost was "only fractional" compared to the amount that now must be spent to equip a steel mill.

Emphasising the importance of the new process to smaller communities having a

need for steel products, spokesmen of the companies said:

"Some time in the near future, when the present abnormal demand for steel subsides and prices are deflated, there is going to be a great dislocation of industry in this country, for the simple reason that abandonment of the basing-point method of steel sales will not allow competitive sales of steel in localities far removed from the producing areas. Steel companies, because of the necessity to refrain from freight absorption, will not be able to compete in distant markets and will sell only in their own areas. That would mean that consumers would have to cluster around the steel areas or the steel industry would have to decentralise, building plants throughout the country. With this new continuous casting mould, however, steel companies will be able to move—to move into towns like Dallas and Seattle and other places which are too small to sustain a large and completely integrated steel mill under present conditions."

Licence Facilities

In disclosing plans to license other steel companies to use the new machine, Isaac Harter Jr., plant engineer of the Babcock and Wilcox Tube Company pilot plant, at Beaver Falls, Pa., said that this would be done when experimental work on a larger casting has been completed. Mr. Harter said he was unable to say when the work would be finished on the larger casting, which will have a 45-sq.-in. cross section. Success with a 27-sq.-in. casting was the basis for the announcement of the new process made recently.

JAPAN'S FERRO-ALLOY INDUSTRY

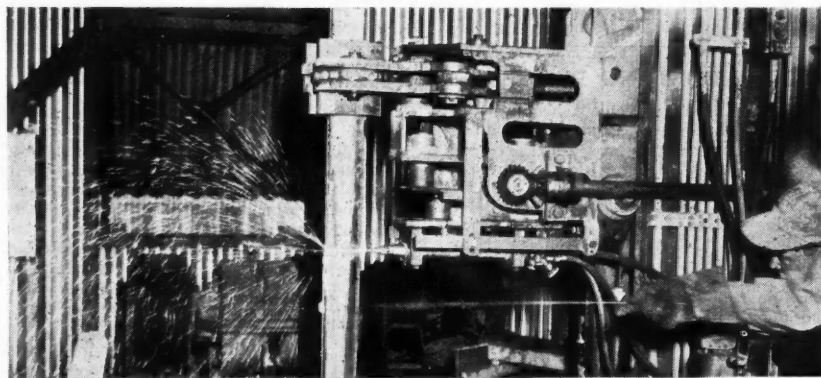
JAPAN'S domestic ferro-alloy industry, which closed down completely after the surrender, and which was re-started in 1946 on a reduced scale, is described in a 52-page publication issued by the U.S. Bureau of Mines. The industry, which reached its peak after Pearl Harbour, was developed in the 'thirties to supply Japan's rapidly expanding steel industry.

Although deficient in iron ores and other mineral resources, Japan established a large and important iron and steel industry between 1931 and 1943. As an integral part, production of special alloys and ferro-alloys also was expanded for use with various grades of steel. In 1940 and 1942, ferro-alloy production reached the record figure of 144,000 metric tons.

Before 1931, ferro-alloys required in Japanese steels were obtained chiefly by imports. During the later years of war and foreign conquest, the industry grew rapidly. At its peak, about 85 plants using more than 340 electric furnaces regularly were smelting 14 different basic ferro-alloys. Steel ingot production also underwent phenomenal development from 1.9 million tons in 1931 to 8 million tons in 1943.

The decline of the Japanese ferro-alloy industry started in 1942, and culminated in the closing of all ferro-alloy plants at the time of the surrender on August 14, 1945.

Six months later, several plants re-opened and by the autumn of 1946, about 22 plants were in partial operation.



As the lower end of the freshly cast billet reaches the bottom of the tower it is cut to any required length by oxy-acetylene flame

Non-Ferrous Metals in Western Germany

Production and Imports Still Inadequate

THE production index for the non-ferrous metals industry in the three Western occupation zones of Germany last year was under 25 (1936 = 100), coal mining was 65, machinery 45, and the general index stood at 39. These figures illustrate the decline in the German non-ferrous metal industry. Redistribution and destruction in war and the changes enforced by zonal barriers since the occupation have all contributed in changing the pattern of German production pre-war.

Compared with the distribution of enterprises in 1938, the British zone has recently had the leading percentage (53.7) of ore mining establishments, followed by the U.S. zone, 20.6; the Russian zone, 16.4; and the French zone, 0.6. The new Polish territories to the East of the Elbe-Neisse line account for 9.7 per cent.

The British zone also has the largest share of metal working plants, 42.1 per cent, followed by the Russian zone, 35.1; the U.S. zone, 15.0; and the French zone, 6.5. Only 1.3 per cent of metal plants are said to be in the new Polish territories. The Russian zone, however, has the largest number of metal goods producing establishments, viz., 47.3 per cent, and the British zone occupies the second place with 24.3 per cent; the U.S. zone possesses 22.0 per cent and 5.6 per cent of the metal goods producing plants are now within the French zone. Poland controls only 0.8 per cent. Although these figures have to be read against the background sketched above, they provide, nevertheless, a useful picture of the basic zonal distribution.

Because large deliveries from the works in the Russian zone are not now possible, the Western zones are forced to supply their requirements from their own plants. War-time destruction has in most areas limited output less than has the lack of ores and skilled labour. Imports last year totalled 4500 tons of aluminium (99.5 per cent), 3100 of electrolytic copper, 180 tons of nickel and 240 tons of tin. All these figures are reported to be considerably below the level of imports envisaged by the British-American authorities.

The following table gives figures for the production of non-ferrous metals in the Bizone in 1947, as compared with the targets and the 1938 production (in tons):—

	1947		1938
	Tons		Tons
	Output	Target	Output
Electro-copper...	18,000	25,000	61,000
Refined copper	15,350	35,000	209,000
Zinc	20,800	58,000	136,000
Lead	24,300	46,000	171,000
Aluminium	11,000	25,000	101,000

Output of electrolytic copper in 1947 showed a threefold increase over 1946, chiefly as a result of the resumption of work by the Nordische Affinerien, Hamburg. Output aggregated 18,333 tons, against 6044.

Special attention has been paid to the production of aluminium, the resumption of which has recently been permitted on a limited scale by General Clay. It is reported that the Töging works were taken off the U.S. list of plants to be dismantled and it is hoped to increase monthly output in the three works Töging, Lünen and Rheinfelden.

NEW BONDING PROCESS

A LICENSING agreement has been concluded between the Fairchild Engine & Airplane Corporation, New York, and Wellworthy Piston Rings, Ltd., Lymington, Hampshire, whereby the latter has received an exclusive licence in the British Isles covering use of Fairchild's Al-Fin process for bonding aluminium to iron, steel, and other metals. In announcing the agreement, the chairman of the Fairchild Corporation said that the contract represented the fourth licence granted for the Al-Fin process in recent months and the first foreign licence. In addition to receiving the rights to manufacture and sell bonded bi-metallic products under the Al-Fin process patents, Wellworthy may sub-license the process to other manufacturers.

COMBATING CORROSION

PRESENTED originally to the Institute of Petroleum, a paper by Mr. B. B. Morton on "Metallurgical Methods for Combating Corrosion and Abrasion in the Petroleum Industry" has now been reprinted by the Mond Nickel Co., Ltd., as one of their standard publications. This booklet contains a wealth of data relating to the use of such materials as stainless steels, Monel, K Monel, Inconel, non-ferrous alloys, alloy cast irons, and comprises 68 pages of text, incorporating 33 figures and 39 tables. Although of direct interest chiefly to plant engineers and metallurgists in the petroleum industry, some of the data presented is likely to be of far more general use.

ADVANCE OF POWDER METALLURGY

Further Papers Presented at Graz

From a Special Correspondent

SEVERAL of the more important papers given at the first International Powder Metallurgy Conference held recently at Graz, were reviewed in *THE CHEMICAL AGE* of August 7, and the following is an account of the remainder of this year's outstanding event in the powder metallurgy world.

On the academic side more than one speaker dealt with work that originally had nothing to do with metal powders. For instance, Professor Kofler, of Innsbruck, demonstrated by means of a film running 15 to 20 minutes the actual phase changes that occur during the sintering of organic powder mixtures having melting points in the region of 100-150°C. The technique was to use a hot-filament microscope with crossed nicols and a time-speed arrangement. While experimental difficulties would be greatly increased if this work were to be duplicated with metal powders, it was thought cinemicrography might well prove useful on some future occasion.

Cohesion Measurement

Another paper, by Professor A. Smekal, was concerned with the initial reaction between solid phases. Groups of exceedingly faint scratches were made on glass and methyl methacrylate resin. The tensile forces set up amounted to 600 tons per sq. in. for the glass and 60 tons per sq. in. for the resin, and it was found that close agreement existed between these values, the magnitude of the chemical valence forces and the mechanical equivalent of the heat evolved. This meant that the magnitude of chemical cohesion in areas below 1 micron could be estimated by a mechanical test. The scratches were made with an alumina tool. In the case of glass, the temperature at the point of contact exceeded 700°C., i.e., the eutectic temperature of the system $\text{Na}_2\text{O}-\text{SiO}_2-\text{Al}_2\text{O}_3$. It followed, therefore, that solid phase reactions are initiated by pressure resulting in a liquid or plastic interface.

The sintering of metal powders was dealt with in a paper by W. E. Kingston, of New York, as previously mentioned. This could not be discussed as the author was not present. It contended that self-diffusion determines the state of the powder from its manufacture onwards, its consequent behaviour during pressing depending on these two factors, also its behaviour during sintering.

In the section devoted to hard metal, the current generic term in this country

for all cemented carbides, British interest was shown by the presentation of five out of nine papers. E. Trent read a contribution from the A.C. Wickman staff which should prove extremely interesting to any carbide manufacturer. It explained fully how the various types of defect occur either during manufacture or as a result of slight variations in the raw materials.

Substituting Tungsten

In addition to this paper and the two papers by A. G. Metcalfe and L. D. Brownlee reviewed last month, there was a full account by R. Kieffer and F. Kölb on their titanium carbide work. As a substitute for tungsten carbide, which, it was thought, will probably always be the most important material in this field, the Germans developed during the war compositions based on titanium carbide, the authors stated. The Metallwerk Plansee concentrated largely upon $\text{TiC}-\text{Mo}_2\text{C}$ and $\text{TiC}-\text{VC}$. The problem of grain size measurement was discussed by P. W. Penrice, who took X-ray photographs with controlled rotation of the specimen and then evaluated the grain size from the line thicknesses. An extended discussion, which followed, on the economics of X-ray control methods was far from conclusive, and other methods such as magnetic saturation measurements also received adequate attention.

Light alloy powder metallurgy was represented by two papers. One by R. Müller and collaborators reported the making of iron-magnesium, iron-calcium, and iron-calcium-aluminium compacts, but these products were said to have so far no industrial use. Work by E. Nachtigall on aluminium-graphite contact elements formed the subject of another paper, but the suggestions for combining aluminium with carbides, diamonds, graphite, alumina, etc., have still to be realised, it was thought.

The session on the Manufacture of Metal Powders was noteworthy for two papers on the D.P.G. disc process by H. Timmerbeil and R. Rapatz, and it was interesting to compare German and Austrian experience in this connection. The Austrians (represented by R. Müller) also described some war-time work on the electrodeposition of copper-lead and cadmium-copper alloys which were used at the time for surfacing iron bearings. This process could well form a source of supply for special alloy powders, the authors suggested.

ELECTROLYTIC METAL POLISHING—I

Some Bases of Current Processes

IT is almost axiomatic that when a basic principle finds new applications they frequently become so numerous and conspicuous that those who laid the foundations are likely to be overwhelmed and forgotten amid the glories of the superstructure.

In the sphere of electrolytic polishing of metals it is desirable to recall the names of Davy and Faraday (see "Davy-Faraday Exhibition in Paris," page xxx), the English discoverers of the basic principles, as our own country does not appear to be very strongly represented in the comparatively new polishing developments which, literally and figuratively, have added such brilliance to this branch of science and industry.

French Pioneer

Most of the credit for contemporary developments has been given to a young Frenchman who, in 1929, discovered an electrolytic method of polishing nickel sheet without mechanical aids. Dr. P. A. Jacquet obtained his degree in 1931 and became one of the chief pioneers in this field. Others for whom this honour, or a share of it, has been claimed, for independent and almost simultaneous similar discoveries, are Drs. C. L. Faust and H. A. Pray, of the Battelle Memorial Institute, Columbus, Ohio, U.S.A.

From the work of these pioneers and others has grown one of the most important and interesting branches in applied physics, micrometallurgy, and general engineering. It has proved abundantly fruitful both in theory and practice. On the purely scientific and theoretical side the study of surface phenomena has been raised to new heights, and on the practical side it has, in recent years, formed the subject of many congresses and symposia, including, for example, the 3rd International Congress on Electrodeposition in London, in September last.

Another important recent congress on surface study—although electro-polishing did not figure very prominently there—was that held in Brussels in January last year by the Société Belge des Mécaniciens, whose proceedings have just been published under the title *Journée des Etats de Surface*.

Papers were contributed here on another great aid to surface study—the electron diffraction microscope—notably by Prof. G. I. Finch, of the Imperial College of Science, with an introduction by Prof. Omer Goche, Brussels University.

It is probably correct to say that these two relatively new factors, electro-polishing and the electron microscope, have become

the most powerful aids in elucidating the many mysteries of surface phenomena and structure in metals and alloys.

With this new method of surface treatment it becomes necessary to define polishing more precisely and to distinguish the electrolytic from the mechanical methods. The former not only imparts a finish which differs in appearance from that obtained mechanically, but, what is much more important, it does not produce any change, stress, or deformation in the surface. The surface remains an exact index and guide to internal structure, both for pure metals and homogeneous solid solutions and for heterogeneous alloys.

With mechanical polishing, however, the presence of impurities and chemical heterogeneities, as well as metallurgical defects, tends to become masked, so that such polished surfaces are no longer a true guide to internal structure. On the other hand, the purely polished or lustrous effect may be produced electrolytically without eliminating the roughness of surface—the geographical peaks and valleys. This is of considerable interest in certain technical or scientific applications.

Further, not only does mechanical polishing mask existing factors but it tends to produce definite changes due to mechanical, thermal, or chemical action. These may include oxidation of the surface, change in crystal form, etc.

Treating Alloys

Although, in electrolytic processes, with heterogeneous or impure metals and alloys, there may persist a certain slight "relief" of surface due to varying rate of anodic solution of impurities or alloy constituents, it is still possible by careful attention to technique to achieve a perfect and smooth polish with such heterogeneous materials. At all events, Jacquet claims to have proved this in respect of lead bronzes. (3rd Intern. Conf.—*Sheet Met. Ind.*, 1947, 24, 2015).

It may seem at first sight, from what has been said about preferential anodic solution and persistence, at least for a time, of some surface irregularity, that electro-polishing is less effective than the mechanical methods for perfect smoothness and dimensional accuracy in precision engineering. It figured hardly at all in the Brussels Congress, where honing was generally the preferred method, as emphasised in papers by British aeronautical engineers (W. E. R. Clay, of Rolls-Royce, Ltd., and F. Nourse, of the Bristol Aeroplane Co.).

It is desirable to recognise limitations of any new development, and to indicate these at the outset. As Samuel Wein says very truly, in two comprehensive papers on the subject of electro-polishing (*Metal Finishing*, February and April, 1948) the method is not universal or capable always of replacing the older mechanical practices.

However, the scope of electro-polishing is sufficiently vast and varied, and the few limitations may be reduced with further study. Its most important application, as already mentioned, is certainly in the physico-metallurgical study of metals and alloys, and especially in micrography (dealt with in a subsequent article). It is evident, too, that it has numerous important and practical uses in metal industry, both from a decorative and protective standpoint.

Stainless Steel

A. P. Schulze, in a series of articles on the fabricating and finishing of stainless steel (*Metal Finishing*, May, 1948), gives ten reasons for using the electro-polishing technique: (1) production of bright finish for sales appeal; (2) impracticable or excessive cost of mechanical methods in some cases; (3) removal of weld scale or discoloration which might cause corrosion; (4) improvement of corrosion resistance—smooth passive surfaces of stainless steel resist border line conditions better; (5) removal of sharp burrs or edges; (6) simplified inspection for quality—seams or irregularities of surface are exaggerated by electro-polishing; (7) elimination of one or more

steps in mechanical buffing; (8) removal of grey film or skin caused by previous operations (9) improvement of finish of knurled surfaces; (10) better control of size or weight.

These all relate to stainless steel, and it is with this material, i.e., of the 18/8 type, and with nickel silver, that much recent work both in this country and in the U.S.A. has been concerned.

The Mond Nickel Co., Ltd., for example, has developed improved methods for electro-polishing both these materials, some of which were described in a paper by H. Evans and E. H. Lloyd, read before the Electrodepositors' Technical Society last year (*Journal of the ETS*, 1947, 22, 73-84)

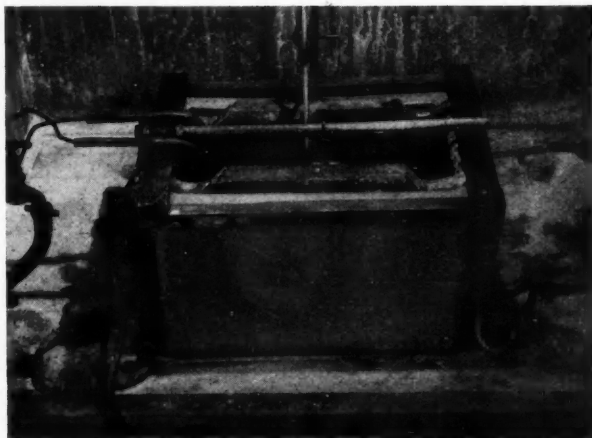
Differing Electrolytes

Very many different electrolytes have been used and proposed for electro-polishing, many of which are quoted by Schulze (*loc. cit.*). In the present usage, however, they were at first limited to about four and eventually to one: (a) perchloric and acetic acids, (b) citric and sulphuric acids, (c) o-phosphoric and sulphuric acids, (d) o-phosphoric acid, glycerine, and water.

The first, though very efficient, has a serious element of danger, although it is claimed this can be almost wholly eliminated with reasonable care. Evans and Lloyd preferred the last for good all-round efficiency and economy. The citric-sulphuric type forms the subject matter of some of the innumerable patents, as in U.S. Patents Nos. 2,331,721 and 2,335,354, in which an electrolyte consisting of 60 per cent citric, 15 per

A 3½ gal. (17 litre) polishing vat in which the water-cooled hollow lead cathodes are placed 6in. apart

(Photograph by courtesy of the Electrodepositors' Technical Society)



cent sulphuric, 25 per cent water, and 4 per cent methanol is protected.

Electrolytic polishing may be defined as anodic in an electrolyte; and, according to Jacquet, Elmore and others, polishing is due to anodic solution of high points on the surface of the material in preference to low points, until a bright smooth surface is obtained.

Such selective solution may be explained by assuming early formation on the anode surface of a viscous protective film, consisting of anodic corrosion products; and its break down at the high points is due to the higher potential gradients there. At the lower points the film, however, remains intact and prevents solution. (See P. A. Jacquet: "Le Polissage Electrolytique des Surfaces métallurgiques," Vol. 1, 1948, p. 70). The filling up of valleys and levelling of hills, presumably can never be quite complete, and it would seem that there is nearly always a certain amount of ripple, visible under a powerful microscope.

Standard Equipment

Equipment generally does not vary very greatly, consisting of a container for the electrolyte, with heating and cooling arrangements, two cathodes opposed in the sides of container, and the article to be polished placed between them to form the anode. The current should be adjustable between 0 and 50 amps. Among the principal factors to be considered are: composition and temperature of electrolyte, current density at the anode, time of operation, and the nature of the original surface.

The best finish was obtained by Evans and Lloyd with an electrolyte consisting of 37 per cent o-phosphoric acid, 56 per cent glycerine, and 7 per cent water, somewhat similar to that used by Uhlig (*Trans. Electrochem. Soc.*, 1940, 78, 265-277). The boiling point of this mixture was 145°C. At low temperatures slightly etched surfaces were obtained on stainless steel spoons, and a very good polish resulted at 100-120°C. Electrical conductivity is higher at such a temperature.

With nickel-silver the optimum temperature was about 60°C. Current density for stainless steel can range fairly widely, but the best results were obtained at 5-10 amp./sq. in. If current density is too low there is slight etching; if too high, the control of temperature is more difficult. Much lower c.d. is suitable for nickel silver than for stainless steel, namely, 1 amp./sq. in. The time required depends, of course, on these factors and possibly still more on preliminary treatment.

Rapid Steel Sampling

The "Eye-Dropper" Technique

ENGINEERS at the (U.S.) General Electric Company's Schenectady, New York, works laboratory have developed what is colloquially described as an "eye-dropper" method for sampling molten steel at 2700° F. The implement is a heat-resistant glass tube, about the diameter of a lead pencil and 18 in. long, with a rubber bulb at one end. Liquid steel fresh from the furnace is drawn up into the tube by squeezing the rubber bulb, just as an eye-dropper draws normal liquids. The steel hardens into a smooth, homogeneous rod within five minutes, the glass is cracked from it, and the sample rod is ready to be checked for quality.

In a Few Minutes

While older sampling techniques required much time and involved such laborious operations as cutting a block from a hardened steel mass, machining it into a rod, and buffing it to a high polish, with the new technique samples may be prepared for analysis in a few minutes.

Cut in two and fitted into sockets before a spectrograph, the sample forms two electrodes of a high-voltage arc. An electric spark between the two provides spectrographic evidence of the make-up of the electrodes.



Liquid steel being drawn up the heat-resistant glass sampling tube

NEW BERYLLIUM ALLOYS

Five American Patent Applications

FURTHER additions to the range of beryllium alloys for which special claims are made are specified in a series of recent British patent applications, Nos. 6042-6046/1948, in the name of the Allegheny Ludlum Steel Corporation, of Brackenridge, U.S.A.

No. 6042/1948 (Conv. date 28/7/42, U.S.) relates mainly to magnetic steels, for which it is said the chromium steels have not proved entirely satisfactory. In the present invention a small amount of beryllium is included to impart the exceptional magnetic and physical properties desired in magnets and other articles of manufactured steel, including greater hardness and strength and better fluidity when molten.

Carbon content is from 0.1-1.25 per cent, chromium 1.8 per cent, and beryllium from 0.03-0.7 per cent. The alloy may also contain from 0.1-0.5 per cent silicon and manganese, with the usual impurities: phosphorus and sulphur. Properties and test results are described in detail and tabulated.

Patent No. 6043/1948 (Conv. date 28/7/42, U.S.) claims improvements in beryllium-cobalt alloy steels and articles made from them, especially tool steels, die steels, and structural steel. Numerous alloys and treatments have been proposed to give the requisite hardness and other properties.

Principal Constituents

In the present series of alloy steels the principal constituents are: 0.5-14 per cent chromium, 0.1-1 per cent cobalt, 0.05-0.5 per cent beryllium, 0.25-2.5 per cent copper. They are capable of being hardened up to a Brinell hardness of 600, by suitable heat treatment. Carbon content is 0.1-3 per cent. Tables of properties and tests are given. Heat treatments include heating up to 1450-1550°F., followed by air cooling; much lower temperatures than usual are claimed. The composition may also include molybdenum.

Patent No. 6044/1948 (Conv. date 28/7/42, U.S.) claims to afford improvements in chromium-free air-hardened alloy steels and articles made from them, either cast or wrought, especially tools, dies etc. An example is the Mushet type alloy, containing 0.03-0.3 per cent beryllium, 0.25-2.5 per cent copper, 0.5-2.5 per cent silicon, 0.5-2.5 per cent manganese, and 0.75-3.25 per cent molybdenum. Brinell hardness ranges from 600 to 653, and heating temperatures are again low.

Chromium-beryllium alloy steels and products are the subject of Patent No. 6045/

1948 (Conv. date 28/7/42, U.S.). The proposed uses include castings and rolling mill products; and particularly castings for which the usual chromium and stainless steels are not altogether suitable, owing among other things to unsatisfactory fluidity. Intricate and complicated castings are possible. Composition is: 0.5-14 per cent chromium, 0.5-4.5 per cent silicon, relatively small amounts of beryllium, 0.5-6 per cent copper, 0.05-2 per cent carbon, up to 0.5 per cent manganese. These alloys are characterized by high strength, fluidity, and good ductility when subjected to loads suddenly applied.

Covering a similar field is Patent No. 6046/1948 (Conv. date 28/7/42) concerned with beryllium-copper alloy steels and applications.

IMPROVED SURFACE HARDENING

AN improved process for surface hardening is claimed in the British patent application No. 410/1948 (open to public inspection) by Elektriska Svernetings A/B, Herkulesgatan, Goteborg.

The method consists of induction heating and subsequent rapid cooling in air or gas until the temperature of the surface zone reaches a pre-determined value, followed by liquid cooling in water. To avoid undesirable structural change in a certain critical temperature interval during cooling—if cooling is below a definite minimum rate exceeding that attainable in a gaseous cooling medium—the article is subjected to liquid cooling as soon as the temperature of the surface zone falls to a value exceeding by a pre-determined amount (e.g. between 0° and 100°) the upper limit of the critical temperature interval.

Chromium manganese steels are subjected to liquid cooling when the temperature of the heated zone has fallen to 400°-500°C. A gaseous cooling medium may be applied during the heating period as well. Quenching may be done in a liquid-gaseous current.

The patent application also describes suitable apparatus.

U.S. Petroleum Prices Coming Down?—

Unconfirmed reports state that one American company has reduced the price of its petroleum and that others are likely to follow suit.

Current Welding Research

New Work by the BWRA

THE annual report (1947-48) of the British Welding Research Association, recently issued, gives much interesting information on the research and work in progress sponsored by the various committees. The activities of the committees and sub-committees on Ferrous Metals (Engineering) are typical. Among these, the actual load carrying capacities of welded steel structures with rigid connections, and the development of rational methods of designing such structures, are being investigated with small-scale frames at the Association's engineering laboratory, Cambridge, and with full-scale frames at its engineering research station, at Abington Hall, Abington, near Cambridge. Then, recommendations for further research on the strength and rigidity of welded structural connections are contained in the full report of work already completed.

Further work on the radiography of welded pressure vessels is to be undertaken, and, with the completion at the Abington laboratories of the installation of testing equipment for carrying out fatigue tests by the resonance vibration method, the investigation into the behaviour of welded structures under dynamic loading are being developed.

Metal Arc Welding

An interesting memorandum which is nearing completion is that on the metal arc welding of butt joints in pressure pipe lines. Research into the stresses in welded pressure vessels is continuing, and attention is concentrated on the measurement of stresses in welded nozzles in a full-scale vessel. The committee on codes of practice for welded building structures has under consideration the preparation of a memorandum on: beam and column connections, and also being considered is the need to carry out further research work on the heat treatment of welded constructions.

In connection with the drafting of specifications for electrodes, attention is being given to suitable test requirements for mild steel electrodes of the deep penetrating type. Other investigations are into pipe connections and fittings fabricated by welding, the development of logical design methods, and further tests on seamless and welded pipe bends, and a further memorandum being issued is on faults in arc welds, with illustrations of typical faults in welds of mild and low alloy steels. Still other memoranda in course of preparation are on non-destructive methods for the examination of welds.

Brazing Magnesium

Satisfactory Process Claimed

A SATISFACTORY process for brazing magnesium is stated to have been developed by the Dow Chemical Company, Midland, Michigan, U.S.A., which states that the three commonly used brazing methods—furnace, flux dip and torch—are applicable to magnesium. A flux must be present to free surfaces from oxide or other films to permit capillary flow.

For furnace brazing, the parts to be joined are assembled with pre-placed brazing alloys, fluxed and heated to the required temperature in a furnace. In flux dip brazing, the assembled parts are dipped in a molten flux bath. Torch brazing is similar to gas welding, except that little or no melting of the base metal occurs. It is accomplished by using standard gas welding equipment employing a natural oxy-acetylene or natural gas-air flame.

The brazing process, because of its dependence on capillary flow, especially in furnace and flux dip methods, requires careful design of joints with exact clearance (0.0004-0.010 in.) and adequate placement of filler metal.

Magnesium brazing temperatures are between 1075°F. and 1160°F. Brazing of Dowmetal M magnesium alloy is commercially practicable, say the company's officials, but brazing for other alloys is still in the experimental stage.

The clean joints resulting from such brazing need little or no dressing, being smooth when completed. Another advantage of the process is that parts too thin to be welded can be brazed. Since both the brazing alloy and the part to be welded have magnesium as their base, the danger of galvanic corrosion is more or less eliminated. In brazing magnesium, however, there is some danger of flux entrapment, which must be guarded against in the gas welding process.

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Home News Items

Signals Research.—The Ministry of Supply Signals Research and Development Establishment at Christchurch, Hampshire, is holding an "Open Day" on Thursday, September 23.

Change of Address.—From September 13, the headquarters of the Export Licensing Branch of the Board of Trade, now at Stafford House, King William Street, London, E.C.4, will be removed to Regis House, which is in the same road. Telephone number: AVenue 3111.

Firemen Prevent Explosion at Tar Works.—An outbreak of fire at the Scottish Tar Distillers Ltd. works, Clark Street, Paisley, last week, involved naphthalene, tar vats and tar barrels. Brigades from surrounding districts were able to prevent an explosion and had the blaze under control in less than an hour.

Danish Exhibition Changes.—The Federation of British Industries has announced the following alterations to the exhibitors' lists for the British Exhibition at Copenhagen this year: the deletion from the Forum Extension group of S. G. Brown, Ltd. (instrument makers and precision engineers) and Electrothermal Engineering Ltd. (thermostats, switches and wires); Chemo-Metals (London), Ltd., has been added to the list of exhibitors at the Gutenberghus.

No Revival of Coal Output.—The prospect of attainment of the 1948 total of 200 million tons of deep-mined coal appeared to recede last week, when mine output totalled 3,740,600 tons, some 21,000 tons less than in the previous week. Production of open-cast coal increased to 218,000 tons. Lord Hyndley stated last week that an average output of 4,170,000 tons weekly would be required to reach the coal target by the end of the year.

Revised British Standards.—The British Standards for three types of portable fire extinguishers—water type, soda acid, B.S. 138; water type, gas pressure, B.S. 1382; and foam type, B.S. 740 Pt. 1—have been revised. The principal object of the revisions is to provide for welded construction in addition to the construction already covered in the original documents. The standards provide full details of the materials to be used, the methods of construction, tests to be carried out on the finished extinguishers and the required markings. Copies are obtainable from the British Standards Institution, Sales Department, 24 Victoria Street, London, S.W.1. Price 2s. 6d., post free.

Physical Chemistry in Pharmacy.—Mr. N. Evers, chairman of the British Pharmaceutical Conference, which began on Tuesday at Brighton, said, in the course of his opening address, he thought the importance of physical chemistry to pharmacists would increase in the future with the multiplication of the raw materials of pharmacy, and with the further study of the mode of action and methods of adsorption of drugs in the human body.

Steel Policy Criticised.—Speaking at a luncheon in Glasgow, last week, Mr. C. D. Rigg, a prominent member of the West Scottish steel trade, said steel production was 2 million tons a year higher than the record pre-war output, yet the shipbuilding industry could obtain only two-thirds of its requirements. The reason appeared to be that the Government did not know where the steel was going. In this country there was no steel consumption analysis such as was compiled by the American Iron and Steel Institute, and without such an analysis neither the Government nor anyone else could plan with certitude and efficiency. It amounted to planning without facts, he said.

Rosin and Turpentine Price Cuts.—As from Wednesday the prices of rosin, turpentine and pine oil sold through the agency of the United Kingdom Naval Stores Association have been reduced. For gum rosin a general reduction of £2 per ton is made in all grades. The price of polymerised rosin remains at 65s. 6d. Wood rosin grade B is reduced by £10 per ton and grades K/M, N/WG and WW by £3 per ton. Grade FF and Vinsol are unchanged. Turpentine prices are revised as follows: American gum spirits, £74 per ton net, naked, and Portuguese gum spirits, £64 per ton net, naked—both ex-U.K. store in loaned drums. Pine oil is reduced to £70 per ton net, naked, ex-U.K. store in loaned drums.

Strike at Petrocarbon Site

Constructional workers employed on the 700-acre site of the new Petrocarbon, Ltd., chemical plant, at Carrington, Cheshire, came out on strike last week after a rigger had been dismissed because he was said to have attended to trade union business without first informing his charge hand.

At first about 250 key men were affected, but they were later joined by more skilled workers and on Tuesday it was reported that nearly 600 men were idle.

TECHNICAL PUBLICATIONS

"ANODIC Oxidation of Aluminium and its Alloys" is the title of Information Bulletin No. 14, which The Aluminium Development Association, 33 Grosvenor Street, W.1, has recently published at the price of 1s. The process of anodising being one of surface finishing, this latest bulletin is to that extent related to No. 13: "Surface Finishing of Aluminium and its Alloys." As, however, certain of the finishing processes form a pre-treatment for anodising, separate consideration has been given to the present subject both on the score of logic as well as convenience. The scope of this booklet includes the dyeing of anodised aluminium surfaces and the process of electro-brightening.

* * *

In order to acquaint crop growers with the results of the vast amount of research and experimental work in connection with the use of boron as a fertiliser element, Borax Consolidated, Ltd., has issued Part VI of the series "Boron and Plant Life." This represents a concise collection of widely dispersed information originally published during the period 1936-46, the range of crops also being world-wide.

* * *

A well-produced brochure clearly outlining the activities of the "600" group of companies has recently been issued by George Cohen, Sons & Co., Ltd., for export distribution. Its object is to show firms abroad how this great British industrial organisation can be of service to them.

Entitled *The 600 Group of Companies*, the 130 page booklet is a complete review of all branches of the group and is abundantly illustrated with photographs, diagrams and specification charts. A kindred publication, in condensed form, is being prepared in French and Spanish.

Among the many divisions of the group are those which supply modern secondhand and reconditioned chemical and process plant of all types; plastic moulding, rubber and hydraulic machinery; and new stainless steel equipment.

* * *

A new booklet on Poland and a revised edition of the Portuguese East and West Africa guide in the "Hints to Business Men" series are now available. United Kingdom business men visiting these countries on export business can obtain copies of the booklets from the Export Promotion Department, (Dissemination Section), Thames House North, Millbank, London, S.W.1.

PERSONAL

DR. WILLIAM OGILVIE KERMACK, biochemist at the Royal College of Physicians Laboratory, Edinburgh, has been appointed to the new MacLeod-Smith Chair of Biological Chemistry by a meeting of Aberdeen University Court. Dr. Kermack is associated with contributions to the knowledge of synthetic therapeutic compounds, and is the author of several publications and reviews.

MR. JOHN LAMB has relinquished his position as manager of the technical division of the marine department of the Anglo-Saxon Petroleum Co., Ltd., and is to organise and take charge of a new department concerned with marine research and development, with the title of manager of marine research and development, with effect from September 1. Other changes in the marine department include the appointment of Mr. A. LOGAN, in succession to Mr. LAMB, as manager of the technical division.

DR. W. A. MACFARLANE has been lent by the Ministry of Fuel and Power to the Department of Scientific and Industrial Research for about two years for appointment as director of the United Kingdom Scientific Mission in the British Commonwealth Scientific Offices in Washington. He will also be attached for scientific matters in the British Embassy. Dr. Macfarlane has for the past seven years been director of Fuel Efficiency in the Ministry of Fuel. The present director of the mission, Dr. F. N. WOODWARD, is returning to this country towards the end of the year to resume his work as director of the Scottish Seaweed Research Association.

Representatives of the Atomic Energy Organisation of Britain, Canada and the United States are to meet at the Atomic Energy Research Establishment, Harwell, Berkshire, on September 6-8, to reconsider the uniform release of scientific and technical information gained during their combined wartime development of atomic energy. The guide was revised at a conference in America in 1947. The United Kingdom representatives at the conference will be: **SIR JOHN COCKCROFT**, Director, Atomic Energy Research Establishment, Harwell; **Prof. H. J. EMELEUS**, University Chemical Laboratory, Pembroke Street, Cambridge; **Dr. K. FUCHS**, Atomic Energy Research Establishment, Harwell; **Prof. R. E. PEIERLS**, Department of Mathematics, Birmingham University; and **Mr. J. H. AWBERRY**, Department of Atomic Energy, Shell Mex House, Strand, W.C.2.

Overseas News Items

North American Oilseed Crops.—The U.S. is expecting a bumper harvest of soyabean, peanut and oilseed crops this year, and in Canada both the coming linseed crop and the carry-over from last season are far heavier than in 1947.

Shawinigan Company's Power Contract.—Shawinigan Water and Power Company has contracted to supply power to the new titanium smelting plant to be erected at Sorel (Quebec) by the Canadian subsidiary of the Kennecott Copper Corporation. The smelter's first unit, planned to begin full operation in 1951, will require an initial power development of 150,000 h.p.

Patent Office for Bizonia.—The first Patent Office has recently been opened in Darmstadt in the united British-American zone of Germany. Hitherto it has not been possible to register patents in Germany. It is believed that many post-war inventions and developments have not been made public because of the lack of the normal facilities provided by a Patent Office.

Poland's 1949 Output Targets.—The Polish industrial plan for next year forecasts that the total value of the state-owned industry's production will be increased from 21 to 23 per cent over this year's figure. Among output increases expected are: coal, 10 per cent (to 74 million tons); crude oil, 3 per cent; superphosphates, 34 per cent; sulphuric acid, 28 per cent; nitrate, 15 per cent; cellulose, 12 per cent.

South African Uranium.—Speaking in the South African Assembly, the Minister of Mines said the Government had not had time to consider a question regarding steps contemplated to prolong the life of low-grade uranium mines. He added that the extraction of uranium in the terms of the Atomic Energy Bill would doubtless play an important part in prolonging the life of such mines.

Dispersal of I.G.F. Works.—Detailed Allied instructions have been issued by the German Bi-zonal Economics Administration for the dispersal of the factories and other properties of Germany's big chemical combine, I.G. Farbenindustrie, in the British and American zones. The German dispersal panel which must be appointed by the German bi-zonal executive by tomorrow, Sunday, September 5, will work under a special Anglo-American control unit Holding trustee rights over all Farben properties in the two zones, it will dispose of these to a number of independent firms to be created.

New Dutch Refinery.—A large refinery is being built near Rotterdam for the Caltex Petroleum Company at a cost of between 50 million and 60 million guilders. Work was recently started and is expected to be completed in three years. Part of the refined oil will be re-exported.

Swiss Metallurgy in Argentina.—The Argentine Government has recently given permission to the Kopex Sudamericana S.A., a Swiss enterprise formed with the object of manufacturing flexible metal pipes, to work in the country. It has also permitted the entry of 23 members of the company's technical staff and granted foreign exchange permits.

Increasing Bulgarian Opium Production.—The development of a pharmaceutical industry occupies a prominent place in the Bulgarian two-year plan. In particular, the production of opium is being promoted in the southern part of the country. Output rose from 500 kg. in 1945 to 1300 kg. in 1946 and to 4000 kg. last year. For the current year, a figure of 10,000 kg. is possible.

Hungarian Dyestuffs Group.—With the co-operation of the Hungarian Economic Council and the central organisation for basic products and prices, a joint undertaking has recently been established by the foremost Hungarian dyestuffs producers, having in view the development of exports on a considerable scale at the beginning of next year. In particular, brown and black leather dyes will be shipped.

Italian Copper Sulphate.—Italy has considerable stocks of copper sulphate left over from last year because many consumers possess reserves accumulated when a rise in prices was anticipated and are not purchasing fresh supplies. Present consumption is about 60 per cent of the pre-war total, but it is expected that a spread of peronospora in the vineyards will cause an increase in demand.

Australian Steel Prices to Rise?—Speaking in Sydney recently, Mr. H. G. Darling, chairman of Broken Hill Proprietary Company, forecast a rise in iron and steel prices in Australia. He said that Australian prices were still "pounds per ton" below those overseas, and added that there were no signs of abatement in demand for Australian steel because of accumulated war-time orders, post-war industrial expansion and inability to operate production units near capacity through insufficient coal and labour.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

L. SLACK & SON, LTD., Pontypridd. (M., 4/9/48.) July 21, £2545 charge to A. I. Greatrex, Pontypridd; charged on Bishopsgate House, Courthouse, Pontypridd. *£4650. September 29, 1947.

LEDA CHEMICALS, LTD., London. E.C. (M., 4/9/48.) July 26, mortgage and charge, to Midland Bank Ltd. securing all moneys due or to become due to the Bank; charged on factory at Wharf Road, Ponders End, with machinery, fixtures, etc., and general charge. *Nil. December 31, 1947.

SIMONSWOOD MANUFACTURING CO., LTD., Kirkby, near Liverpool. (M., 4/9/48.) July 23, mortgage, to Middleton & Tonge Co-operative Land and Building Society Ltd., securing £16,000 and further advances; charged on land at Kirkby (formerly Royal Ordnance Factory), with buildings and erections known as 81D37 and air raid shelter.

INTERNATIONAL LABORATORIES, LTD., London, S.W. (M., 4/9/48.) July 3, £1000 charge (sec. 97, 1948 Act), to P. B. Frere, London, and another; charged on certain land and buildings at Fishers Lane, Charlbury, and two cottages, etc., situate corner of Sheep Street and Fishers Lane, Charlbury; also July 3, £620 charge (section 97, 1948 Act), to Mrs. G. Dodd, Birmingham; charged on dwelling house, warehouse, bakehouse, etc., situate Thames Street, Charlbury; also July 3, charge (section 97, 1948 Act) to Barclays Bank Ltd., securing all moneys due or to become due to the Bank from Pickups Ltd., and/or the company; charged on Wychwood House with outbuildings and land adjoining Charlbury. *Nil. May 6, 1948.

Company News

The nominal capital of **Gaedor, Ltd.**, 137 Victoria Street, London, S.W.1, has been increased beyond the registered capital of £100, by £299,900, in £1 ordinary shares.

The directors of **P. B. Cow and Company**, rubber and plastic manufacturers, have

announced that they have acquired the entire issued share capital of **Hertfordshire Rubber Company**, manufacturers of industrial mouldings and extrusion products. They had previously intimated that they propose to increase the company's capital by the creation of 487,000 5 per cent cumulative redeemable preference shares of £1.

Chemical and Allied Stocks and Shares

A BETTER tendency has been maintained in stock markets, buyers coming in on the assumption that international news is likely to take a turn for the better. Buying, although still on a very moderate scale, extended from British Funds to industrial shares, prices responding readily in the absence of selling. Shares of chemical and kindred companies participated. Imperial Chemical, however, eased to 44s. 7½d. being sold in order to exchange into the new, which are a cheaper purchase than the old shares. The new shares will not rank for the current year's interim dividend, but they are free of stamp. The new have fluctuated, and after 3s. 9d. premium eased to 3s. 4½d. premium.

Monsanto Chemicals 5s. ordinary were 57s. 6d., and Laporte Chemical 5s. ordinary units changed hands over 20s. with Fisons at 58s. 6d. and Burt Boulton and Haywood at 26s. Albright & Wilson 5s. shares marked 28s. 9d. and Morgan Crucible "A" ordinary were 55s. at which there is a yield of over 4½ per cent on the basis of last year's 12½ per cent dividend. William Blythe 3s. shares continued more active, changing hands around 18s. 7½d. British Glues & Chemicals 4s. ordinary strengthened to 18s. 3d. At £5, Metal Box shares also strengthened in price, but De La Rue receded to 38s. 9d. although among other shares of companies connected with plastics, British Nylonite were steady at £5. British Industrial Plastics 2s. shares again changed hands around 6s. 10½d. and Erinoid were 10s. 9d.

British Oxygen were better at 99s. 4½d. with British Aluminium firm at 47s. 3d., Turner & Newall 76s. and United Molasses 48s. 1½d. Following publication of the full results, the 4s. units of the Distillers Co. firmed up to 26s. 9d. British Plaster Board 5s. ordinary strengthened to 24s. 10½d. General Electric improved to 85s. 3d. in anticipation of consolidated accounts, while Associated Electrical were 72s. 6d. and Johnson & Phillips 68s. 9d. Dunlop Rubber at 73s. 3d. also moved with the general trend.

Iron and steel strengthened, partly because of the good yields, although the

market view is that the Government is likely to introduce its nationalisation Bill in October or November. It is still assumed that in any case nationalisation cannot be effected for two years. Guest Keen strengthened to 47s. 6d. on the full results and chairman's annual statement, and, following the news that the Bank of England has sold the balance of its holdings of shares in the company, Thomas & Baldwins rose to 14s. 9d. Stewarts & Lloyds were better at 53s. 3d. Staveley Coal & Iron improved to 74s. on the possibility of a special distribution to shareholders, although it is not unlikely that cash and other resources arising from nationalisation of some of the company's activities, will be used to increase its chemical and kindred interests.

Triplex Glass 10s. ordinary units improved to 25s. 9d. Amalgamated Metal were firm at 19s. with General Refractories at 22s. and Boots Drug 52s. 9d. British Drug Houses 5s. ordinary strengthened to 8s. 6d. Beechams deferred were better at 19s. 7½d. with Griffiths Hughes at 31s. 6d. Oil shares were uncertain, Anglo-Iranian fluctuating moderately, but Canadian Eagle attracted on further consideration of the annual report, and the price rose to 33s. 3d.

British Chemical Prices

Market Reports

A STEADY demand and a firm price structure characterised most sections of the industrial chemicals market. No outstanding price movements have been reported during the past week and the overall supply position remains unchanged, with deliveries to the chief consuming industries proceeding reasonably satisfactorily. The demand for pitch and for the coal tar products generally continues on a good scale.

MANCHESTER.—Generally firm price conditions have continued on the Manchester chemical market during the past week and, trading conditions on the whole, have been satisfactory. Soda ash, caustic soda and other alkali products are finding a good outlet among home industrial users and a steady demand is being experienced for the general run of ammonia and magnesia compounds, as well as for a wide range of other lines. Buying interest on the part of shippers has been of fair extent, with parcels sought for export to the Dominion and other markets. So far as the by-products are concerned, a steady trade is being done in carboric and cresylic acids, cresosote oil, pyridine and most of the light distillates.

GLASGOW.—In the Scottish chemical market business has been fairly active again

during the past week. Coal tar products have been well absorbed and the demand for inorganic materials, insecticides and detergents has been well maintained. In the export market, inquiries have been on a much heavier scale than in previous weeks and a number of satisfactory orders have been booked. In general, the volume of business is satisfactory for the time of the year.

MANGANESE STEEL CASTINGS

THE British Standards Institution has recently published two British Standards for manganese steel castings for general engineering purposes:

B.S. 1456 for 1½ per cent manganese steel castings, in which two grades of castings P and R are specified according to the ultimate tensile stress obtained from the test piece. The chemical composition of the steel is specified and test requirements relate to the tensile and impact tests. Provision is also made for non-destructive tests and hardness test after heat treatment where required.

Details are included of process of manufacture, fettling and dressing, freedom from defects, provision of test samples, testing facilities, branding and repairs to castings. Appendix A gives recommendations with regard to welding procedure.

B.S. 1457 for austenitic manganese steel castings in which the chemical composition and heat treatment of the steel is specified. Test requirements relate to a hardness test and, where required, a bend test may be called for by the purchaser. The same additional data as for B.S. 1456 are given.

Copies of these standards can be obtained from the British Standards Institution, Sales Department, 24 Victoria-street, London, S.W.1. (2s. each post paid.)

Hungarian Aluminium Plan

Although Hungary is a leading European producer of bauxite, the country's output of aluminium and aluminium goods is very small. Before the war, Hungary exported most of her bauxite to Germany, but the new three-year-plan for industry provides for the extension of existing aluminium plants with a view to ensuring self-sufficiency and establishing an export trade.

The plant at Almasfüzito, which had a pre-war capacity of 7000 tons, is to be enlarged to produce annually about 100,000 tons and the aluminium foundries at Felsőgalla and Ajka are also to be expanded. The industry's technical problems will be investigated at a special research laboratory which has recently been opened at the Budapest Technical Institute.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2, at 1s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Nitrogenous fertilisers.—Imperial Chemical Industries, Ltd., W. Tyerman, R. G. Franklin, R. Parmella, and A. H. Lewis. Jan. 7, 1946. (Cognate Application 35884/46.) 605,829.

Insolubilising treatment of films, filaments, fibres, and like shaped articles made from protein solutions.—Imperial Chemical Industries, Ltd., D. Traill, and A. McLean. Jan. 7, 1946. 605,830.

Process for removing organic sulphur compounds from gases.—Gas Research Board, and A. H. Eastwood. Jan. 7, 1946. 605,839.

Removal of colour from shaped articles comprising a polymer or co-polymer of acrylonitrile.—E. I. Du Pont De Nemours & Co., and J. C. Richards. Feb. 18, 1946. 605,770.

Removal of colour from shaped articles comprising a polymer or copolymer of acrylonitrile.—E. I. Du Pont De Nemours & Co., and R. A. Schneiderbauer. Feb. 18, 1946. 605,771.

Manufacture of long chain carboxylic acids.—E. I. Du Pont De Nemours & Co. March 17, 1945. 605,848.

Manufacture of long chain carboxylic acids.—E. I. Du Pont De Nemours & Co. March 17, 1945. 605,849.

Process for the manufacture of pentaenes.—Roche Products, Ltd. (F. Hoffman-La Roche & Co.). Nov. 5, 1945. (Divided out of 605,208). (Sample furnished.) 605,772.

Process for the manufacture of methacrylamide.—Lonza Elektrizitätswerke und Chemische Fabriken Akt.-Ges. March 21, 1940. 606,096.

Manufacture of solutions of polyvinyl chlorides.—Soc. Des. Usines Chimiques Rhonépoulenc. April 15, 1940. 606,097.

Production of plastic compositions containing polymers or copolymers of vinyl chloride.—Angle-Iranian Oil Co., Ltd., E. W. M. Fawcett, and A. Millien. Oct. 28, 1942. 606,099.

Production of complex metal ammine salts.—A. H. Stevens (Albi Chemical Corporation). Dec. 13, 1943. 605,861.

Refining of crude wax obtained from mineral oil.—Steel Bros. & Co., Ltd., A. D. Armstrong, J. Mitchell, A. M. Fraser, and W. H. Chalmers. Feb. 29, 1944. 605,936.

Process for recovering cyclopentadiene.—Carnegie-Illinois Steel Corporation. July 17, 1941. 606,112.

Centrifugal governors.—R. W. Phelps and L. T. Rutledge. Feb. 2, 1945. 605,942.

Processes for the polymerisation of vinyl compounds.—Soc. Anon. Des Manufactures Des Glaces Et Produits Chimiques De St.-Gobain, Chauny, & Cirey. Dec. 31, 1941. 606,116.

Process of producing substituted acridines and intermediates therefore.—E. Lilly & Co. June 29, 1944. 605,870.

Strongly adherent metal coated articles and means for producing the same.—W. H. Colbert, A. R. Weinrich, and W. L. Morgan. June 24, 1944. 605,871.

Method of forming strongly adherent metallic compound film by glow discharge and articles resulting therefrom.—W. H. Colbert, A. R. Weinrich, and W. L. Morgan. June 24, 1944. 605,872.

Method of forming strongly adherent low reflection coatings by glow discharge.—W. H. Colbert, A. R. Weinrich, and W. L. Morgan. June 24, 1944. 605,873.

Method of recovering hard metal carbides and bond metals from sintered masses.—G. J. Trapp. June 7, 1945. 606,117.

Method of forming an oxidised metallic compound coating.—W. H. Colbert, A. R. Weinrich, and W. L. Morgan. June 24, 1944. 605,874.

Process for the production of imino ethers and amidines.—Ward, Blenkinsopp & Co., Ltd., A. A. Goldberg, and W. Kelly. July 11, 1945. 605,952.

Insecticidal coating compositions.—L. Berger & Sons, Ltd., D. H. Hewitt, L. A. Paxon, and J. Roseman. Oct. 17, 1945. 605,960.

Photographic silver salt emulsions containing dyes and processes of producing such dyes.—Kodak, Ltd. (Eastman Kodak Co.), L. G. S. Brooker, F. L. White, and G. H. Keyes. Nov. 19, 1945. 606,141.

Co-polymers and process of producing them.—H. G. C. Fairweather, (Mathieson Alkali Works). Dec. 12, 1945. (Convention date not granted.) 606,150.

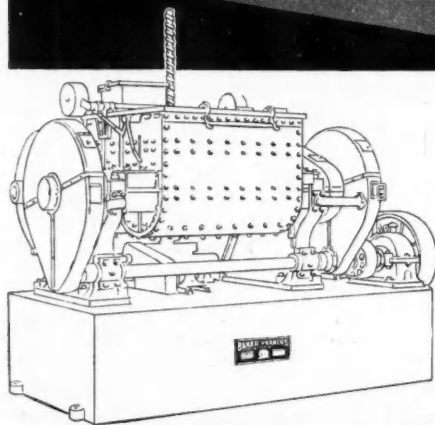
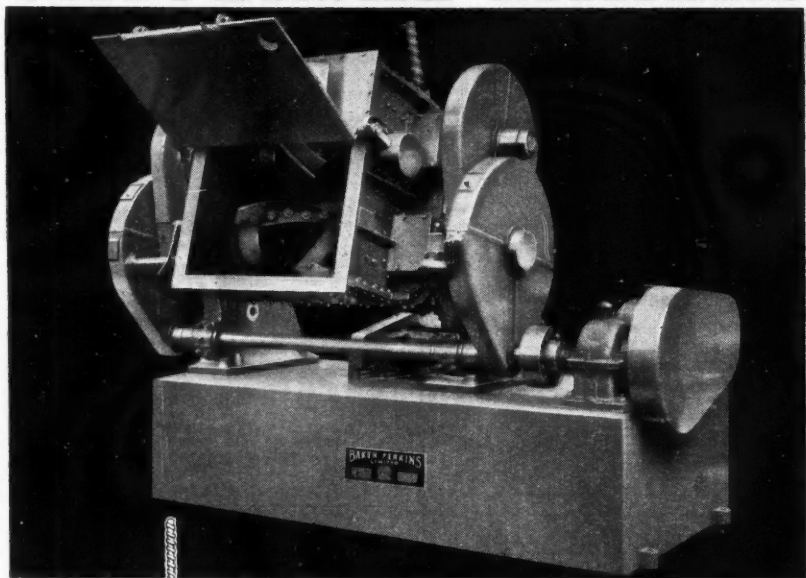
Methods for the production of salts of chlorethane sulphonie acid.—Francais, Etat. Aug. 27, 1942. 605,973.

Manufacture of alkali chlorites.—Solvay & Cie. Feb. 27, 1943. 605,983.

Fuel feeding system for gas turbines.—Bendix Aviation Corporation. Jan. 11, 1945. 605,991.

Manufacture of 1-acetoxy-3-chloropentane-(4).—Roche Products, Ltd., J. A. Low, and R. J. Smith. Jan. 8, 1946. 606,026.

UNIVERSAL MIXERS



The Universal principle is capable of very many adaptations. Here, for instance, is a special machine for mixing Dry Battery Paste. Trough interior and blades are coated with rubber and renewable blade-shoes of hard metal are fitted.

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WESTWOOD WORKS - PETERBOROUGH

Process and arrangement for synthesis of tetrachlorethane.—Solvay & Cie. March 15, 1944. 606,035.

Aryl amines and process of making the same.—E. P. Newton (Parke, Davis & Co.). Jan. 8, 1946. 606,037.

Devices for dispersing pesticidal compounds.—Imperial Chemical Industries, Ltd., D. J. Branscombe, and J. Gillies. Jan. 9, 1946. 606,049.

Production of vinyl co-polymers.—Mo Och Domsjo Aktiebolag. Jan. 17, 1945. 606,050.

Hardness testing machines.—Colloidal Research Laboratories, Ltd., and A. E. G. Baring. Jan. 9, 1946. 606,061.

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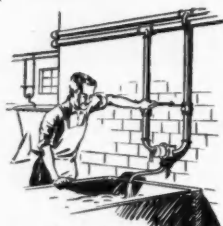
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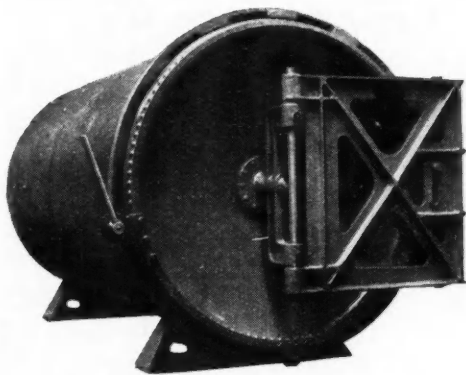
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PICKLING TANKS 60 FEET LONG WORKING SUCCESSFULLY

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RESISTS
Formaldehyde,
Alcohol, Oils, Greases
and Tar Acids, Benzene,
Toluene Compounds HCl,
H₂SO₄, HNO₃, and H₃PO₄,
mixed HNO₃ and HF Acids,
Aqua Regia, Formic, Acetic, Lactic,
Oxalic, Chromic Acids, Bisulphites,
Hypochlorites, Mixed Acids, Peroxides,
Nascent Halogens and Alkalies.

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SOLE MAKER OVER 50 YEARS' EXPERIENCE

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